DOCUMENT RESUME

ED 366 794 CE 065 685

AUTHOR Scanlon, Dennis C., Ed.; Bruening, Thomas H., Ed.
TITLE Defining the Social Context through Agricultural Research. Proceedings of the Annual National Agricultural Education Research Meeting (20th, Nashville, Tennessee, December 3, 1993).
PUB DATE 3 Dec 93
NOTE 472p.
PUB TYPE Collected Works - Conference Proceedings (021) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC19 Plus Postage.
DESCRIPTORS *Agricultural Education; Beginning Teachers; *Cognitive Style; *Distance Education; Educational Attitudes; *Educational Improvement; Educational Needs; Extension Education; Farm Management; Higher Education; Integrated Curriculum; Job Training; Mathematics Instruction; *Minority Groups; Occupational Safety and Health; *Research Projects; Science Instruction; Secondary Education; Student Organizations; Teacher Qualifications; Vocational Education

ABSTRACT

Selected papers are as follows: "Agriculture, Environmental Science and the Relationship of Agriculture to Academic Courses as Perceived by 10th Grade Students" (Newsom-Stewart; Sutphin); "Factors Related to Recruitment and Retention of Ethnic Minority Youth in the Ohio 4-H Program" (Bankston, Cano); "Hispanics in Agriculture" (Nichols, Nelson); "Factors Influencing Minority and Non-Minority Students to Enroll in an Introductory Agriscience Course in Texas" (Talbert, Larke); "Influence of Agriscience and Natural Resources Curriculum on Students' Science Achievement Scores" (Connors, Elliot); "Mathematical Problem-Solving Ability of Secondary Agriculture Teachers" (Miller, Gliem); "Factors Influencing Resource Sharing between Agriculture and Science Teachers Participating in the Agriscience Program" (Whent); "Evaluation of the Pilot Testing of the Biotechnology in Agriculture Curriculum in Oklahoma" (Horne, Key); "Agricultural Distance Education" (Miller, Honeyman); "Relationship between Levels of Cognition of Instruction and Learning Style of Horticulture Teachers" (Cano, Metzger); "Cognitive Learning Style Preferences of the Minnesota Farm Business Management Educators" (Joerger, Persons); "Relationship between Students' Ability to Demonstrate the Problem Solving Approach to Teaching in a Methods Class and Their Learning Styles" (Raven, Shelhamer); "Distance Education in Agriculture" (Miller, Honeyman); "Conceptual Model for Effectively Planning and Delivering Distance Education Courses and Programs in Agriculture" (Jackson, Bowen); "Extent Student Teachers Utilized the Problem-Solving Approach to Teaching during the Student Teaching Practicum" (Garton, Cano); "Training Needs of Area Specialized Extension Agents in the North Carolina Cooperative Extension Service" (Gibson, Hillison); "Relationships between Occupations of Home-Based Workers and Selected Demographic and Work Characteristics" (Furry, Radhakrishna); "Inservice Education Needs of Teachers of Pilot Agriscience Courses in Mississippi" (Newman, Johnson); "National Study of Student Teaching Requirements in Agricultural Education" (Deeds); "Cognitive Abilities of College of Agriculture Students across Traditional Content Areas" (Torres, Cano); "Quantitative Guide to Assess Institutional Excellence in Vocational Education" (Wardlow, Joerger); "Perceptions of Young Farmers Regarding the Role of International Agriculture in Agricultural Education" (Elbasher, Martin); "Interactive Video Network" (Swan); "Agricultural Literacy Assessment among Educators in Missouri Secondary Schools that Offer Agricultural Education Programs" (Harris, Birkenholz); "Safety Practices in Agricultural Science Laboratories" (Swan). (KC)

****
*   Reproductions supplied by EDRS are the best that can be made   *
*   from the original document.   *
****

ED 366 794

Proceedings of the Twentieth Annual

National Agricultural Education Research Meeting

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☑ This document has been reproduced as received from the person or organization originating it
☐ Minor changes have been made to improve reproduction quality

- Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
S Scanlon
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)"

Defining the Social Context Through Agricultural Research

December 3, 1993

Nashville, Tennessee

CE 065 605

NAERM 1993 REVIEW PROCESS

The National Agricultural Education Conference review is a scholarly process that enables the profession to maintain a critical peer review. In order to insure this high level of credibility was maintained, the twentieth annual Agricultural Education Research Conference was reviewed by individuals who are reviewers for the Journal of Agricultural Education. The conference co-chairs determined that the experience and expertise of these individuals would strengthen the evaluation of the papers submitted and ultimately the quality of the conference.

Each paper was blind-reviewed by four individuals not located at the same institution. Each reviewer evaluated each paper on a 11 point Likert-scale based upon a established criterion measure that evaluated: clarity and the purpose and objectives of the paper, the use of research methods and procedures, the clarity of results, how the conclusions were supported by the findings, the significance of the study to the profession and the organization and grammar usage in the paper. In addition, each paper was scored on a composite recommendation scale by the reviewer for inclusion in the conference. After all of the papers were sent back to the conference co-chairs, the scores of all four reviewers were aggregated and means were determined. Once this was completed, the highest scoring papers (48) were selected for presentation at Nashville, Tennessee. An additional 7 papers were selected as alternate papers. Only 40% of the 119 papers submitted were accepted for presentation.

As co-chairs of this conference we are very pleased to present these papers for your review. We feel confident that these papers represent some of the best work in the profession and hope that they will stimulate the appropriate programmatic actions and educational change.

The Twentieth Annual
National Agricultural Education Research Meeting

December 3, 1993
Marriott Hotel
Nashville, Tennessee

Defining The Social Context Through Agricultural Research

Volume XX

The Proceedings of the

National Agricultural Education Research Meeting

Dennis C. Scanlon — Thomas H. Bruening
Associate Professor — Assistant Professor
Department of Agricultural and Extension Education
The Pennsylvania State University
University Park, PA 16802

Co-Chairs
The Twentieth Annual
National Agricultural Education Research Meeting

December 3, 1993

Nashville, Tennessee

TABLE OF CONTENTS

Papers Presented ii
Alternate Papers vi
Preface vii
Previous Meetings and Chairpersons ix
Acknowledgments ix
Reviewers ix
Discussants ix
Chairpersons ix
Facilitators ix
A Complete Listing of the Paper Proposals Submitted for Consideration at the 1993 National Agricultural Education Research meeting 447

Papers Presented

Session A: Underrepresented Populations in Agricultural Education *1*

Agriculture, environmental science and the relationship of agriculture to academic courses as perceived by tenth grade students: Comparisons by gender and ethnicity
Mhora Newsom-Stewart, H. Dean Sutphin (Cornell) 2

Factors related to recruitment and retention of ethnic minority youth in the Ohio 4-H program
Joanne Bankston (Kentucky State), Jamie Cano (Ohio State) 9

Hispanics in agriculture: Barriers to educational recruitment
Timothy Nichols, Clifford Nelson (Washington State) 15

Factors influencing minority and non-minority students to enroll in an introductory agriscience course in Texas
B. Allen Talbert, Alvin Larke, Jr. (Texas A&M) 23

Session B: Integrating Science and Math into Secondary Agriculture Programs *32*

The influence of agriscience and natural resources curriculum on students' science achievement scores
James Connors, Jack Elliot (UArizona) 33

Mathematical problem-solving ability of secondary agriculture teachers
Greg Miller (Iowa State), Joe Gliem (Ohio State) 41

Factors influencing resource sharing between agriculture and science teachers participating in the agriscience program
Linda Whent (UC-Davis) 49

Evaluation of the pilot testing of the biotechnology in agriculture curriculum in Oklahoma
Jeffrey Horne, James Key (Oklahoma State) 58

Session C: Learning Styles of Students in Agricultural Education Programs............ 66

Agricultural distance education: A valid alternative for higher education?
Greg Miller, Mark Honeyman (Iowa State) 67

The relationship between levels of cognition of instruction and learning style of horticulture teachers
Jamie Cano, Susan Metzger (Ohio State) 75

Cognitive learning style preferences of the Minnesota farm business management educators
Richard Joerger (UWisconsin-Madison), Edgar Persons (UMinnesota).......... 82

The relationship between students' ability to demonstrate the problem solving approach to teaching in a methods class and their learning styles
Matt Raven, Van Shelhamer (Montana State) 89

Session D: Farm Business Management and Extension Education Programs........... 98

Self-perceived leadership behaviors and practices of county extension directors: A national perspective
Rama Radhakrishna, Ed Yoder, Connie Baggett (Penn State)...................... 99

A study of the adoption and non-adoption of approved practices by Minnesota dairy farm operators
Earl Bracewell, Edgar Persons, Abderrazak Lakjaa, Chunju Chen (UMinnesota) 108

A comparison of information sources used by farmers who enrolled and those who did not enroll in selected farm business management programs in Minnesota
Larry Klingbeil (East Texas State), Edgar Persons, Chunju Chen (UMinnesota) 117

Servqual assessment of the service quality provided by Minnesota extension service
Chunju Chen, Gary Leske, Richard Krueger (UMinnesota) 125

Session E: Distance Education in Agriculture 133

An assessment of the educational delivery systems employed by commercial field agronomists in publicly and privately owned cooperatives
Robert Martin, Delbert Voight, Jr. (Iowa State).................................... 134

Distance education in agriculture: Teaching and learning through videotape
Greg Miller, Mark Honeyman (Iowa State).................................... 141

A conceptual model for effectively planning and delivering distance education courses and programs in agriculture
Gary Jackson (Mississippi State), Blannie Bowen (Penn State) 149

The extent student teachers utilized the problem-solving approach to teaching during the student teaching practicum
Bryan Garton, Jamie Cano (Ohio State) 157

Session F: Training Needs and Information Sources of Extension Education *164*

An analysis of information sources used in dairy reproductive management
Fawzia Sulaiman (Indonesia Ministry of Agriculture)
Connie Baggett, Ed Yoder (Penn State) 165

Training needs of area specialized extension agents in the North Carolina cooperative extension service
Jerry Gibson (NC CES), John Hillison (VPI & SU) 174

Development of an action research process to evaluate and implement a new vision in the Cornell cooperative extension 4-H youth development program
Mhora Newsom-Stewart (Cornell) 183

Relationships between occupations of home-based workers and selected demographic and work characteristics
Marilyn Furry, Rama Radhakrishna (Penn State) 192

Session G: Beginning Teacher Competencies, Student Teaching Requirements, Pilot Agriscience Courses, and Educational Competency Levels *201*

Inservice education needs of teachers of pilot agriscience courses in Mississippi
Michael Newman, Donald Johnson (Mississippi State) 202

Comparing levels of competence of occupational educators in their ability to carry out professional teaching competencies
Vernon Luft (UNevada-Reno) 211

A national study of student teaching requirements in agricultural education
Jacquelyn Deeds (Mississippi State) 219

Perceptions of critical competencies for the survival of beginning agriculture and home economics teachers from four educational perspectives
Laurie Nichols, John Mundt (UIdaho) 227

Session H: Adoption Diffusion Theory, Cognitive Abilities of Students in Colleges of Agriculture, and Opinions of Colleges of Agriculture Graduates Concerning Curricular and Extracurricular Activities *235*

Cognitive abilities of college of agriculture students across traditional content areas
Robert Torres, Jamie Cano (Ohio State) 236

Opinions of graduates concerning the curricular and extra-curricular activities of the college of agricultural sciences
Cynthia Wrye, Robert Terry, Jr. (Texas Tech) 244

The efficacy of the adoption diffusion theory for agricultural education
Timothy Rollins (Penn State) 253

The application of exploratory factor analysis in agricultural education research
Matt Raven (Montana State) 262

Session I: Agricultural Education Programs: Secondary and Postsecondary *271*

Education and beyond experiences of postsecondary vocational-technical education program participants based upon selected characteristics
M. Susie Whittington, Lou Riesenberg (UIdaho).................................. 272

Longitudinal study of undergraduate agriculture majors: 1977, 1982, 1987 and 1992
Walter Taylor, Donald Johnson (Mississippi State) 281

A quantitative guide to assess institutional excellence in vocational education
George Wardlow (UArkansas), Richard Joerger (UWisconsin-Madison)........ 289

An evaluation of the secondary agricultural education summer program as viewed by Idaho public school administrators
John P. Mundt (UIdaho), Jack W. Blattner (Merridian [ID] High School........ 296

Session J: Computer Assisted Instruction, Instructional Video and International Agriculture *304*

Predictors of teachers' computer use in Korean vocational agriculture high schools: A proposed framework
Seung Il Na, Kirby Barrick (Ohio State), Mu-Keun Lee (Seoul National University) 305

The perceptions of young farmers regarding the role of international agriculture in agricultural education
Kamal Ali Elbasher, Robert Martin (Iowa State) 314

Interactive video network - Educational instructional methods
Michael Swan (North Dakota State) 323

The effectiveness of computer-assisted instruction in a landscape plant use course
Mona Rae Corbett, Christine Townsend, Jayne Zajicek (Texas A&M) 330

Session K: FFA Contests and Awards, Agricultural Literacy, Integrating Math into Secondary Programs, and Attitudes of Cooperating Teachers Regarding Student Teaching Experiences *339*

Integrating mathematics concepts into secondary agriculture programs
Greg Miller (Iowa State), Joe Gliem (Ohio State).................................. 340

Agricultural literacy assessment among educators in Missouri secondary schools that offer agricultural education programs
Clark Harris (State Fair Community College), Robert Birkenholz (UMissouri) . 348

Perceived value of FFA contests and awards by students and other adult groups
Mark Blakely, Marilyn Holschuh (Synergy Research, Indianapolis), Bob Seefeldt (National FFA Organization), Glen Shinn (Clemson), Edward Smith (Oklahoma State Department of Education), Paul Vaughn (Texas Tech).......... 355

Differences in attitudes of agricultural education and other vocational education cooperating teachers regarding student teaching expectations
Jim Flowers (North Carolina State).. 362

Session L: The Effects of Hearing Protection Devices and Safety Practices in Agricultural Mechanics *371*

Safety practices in agricultural science laboratories
Michael Swan (North Dakota State) 372

The effect of hearing protection devices under pink noise conditions on motor and cognitive performance
Glen Miller, Steve Schimpp (UArizona) 379

Perceptions of farmers regarding indigenous knowledge systems
B. Rajasekaran, Robert Martin (Iowa State).. 385

Readership survey of the FFA New Horizons magazine
James Connors, Jack Elliot (UArizona), Dave Krueger (Michigan State)......... 393

Alternate Papers

Factors related to the decision to adopt or not adopt new technology
Jonathan Atherton, Joe Harper, Glen Shinn (Clemson).............................. 401

Perceptions of university students about issues related to agriculture
Robert Terry, Jr., David Lawver (Texas Tech) 408

Variables associated with attitudes of teachers toward computers in Korean secondary vocational agriculture programs
Seung Il Na, R. Kirby Barrick (Ohio State) 416

An evaluation of the leadership involvement of alumni from the Nebraska leadership education/action development program--A ten year followup study
Roy Dillon, Larry Andelt (UNebraska, Lincoln).. 424

Perceptions of agricultural extension agents regarding agricultural biotechnology training and information needs
Robert Martin (Iowa State), Craig Williams (Indiana CES) 428

Effects of equipment maintenance and operation variables on energy use in the agricultural mechanics laboratory
Stanley Burke (Virginia Tech).. 435

Characteristics of the dairy industry in the 21st century with implications for curriculum development in agricultural education
Gearl Collins, Jr. (Greene-Taliaferro CHS), Maynard Iverson (UGeorgia)...... 442

Preface

Nineteen hundred and ninety-three marks the 20th year that the National Agricultural Education Research Meeting has been in existence. Over the years the meeting has grown from a meager beginning in New Orleans in 1974 to a nationally recognized prestigious research meeting in 1993. In 1974 the meeting was chaired by Hollie Thomas out of Florida State University, presented a grand total of ten papers, and did not publish proceedings.

The 1993 meeting will present 48 papers selected from a field of 119 and offer a proceedings of over 450 pages. Truly we have grown! But has the quality, focus and intensity of the research grown better? There is an old educational maxim that says: the only thing new in education is the people, and concepts and solutions to problems follow a twenty-year rotation cycle. As you read through these proceedings and the original purposes of the NAERM meeting, decide for yourself whether we are truly defining the social context through agricultural education research or if we are just "coming around again."

1. To present and disseminate the most recent and best research on the national level as judged by referees.

2. To present and disseminate critiques of the research by researchers in the profession.

3. To provide a forum for discussion of research in agricultural education.

4. To provide feedback to authors regarding research procedures and methodology used.

5. To provide suggestions to authors for preparing manuscripts for publication.

6. To give novice researchers an overview of current research issues, methodology, and critique within the profession.

7. To improve the quality of research conducted in future years.

8. To identify and recognize the outstanding paper presentation at the National Agricultural Education Research meeting on an annual basis.

9. To provide a written record of quality research completed and professional critique over time.

10. To broaden horizons and chart new directions for the conduct of agricultural education research in the future.

The standard of excellence for he 1993 NAERM was established by those who chaired the previous meeting. We hope this 1993 meeting will meet and exceed those standards of excellence set over the past 19 years, and that future chairpersons will strive to reach new heights of excellence.

Dennis C. Scanlon
1993 NAERM Co-Chair

Thomas H. Bruening
1993 NAERM Co-Chair

Previous Meetings and Chairpersons

1.	1974	New Orleans, LA	Hollie Thomas, Florida State University
2.	1975	Anaheim, CA	Hollie Thomas, Florida State University
3.	1976	Houston, X	Glen Shinn, Mississippi State University
4.	1977	Atlantic City, J	William Richardson, Purdue University
5.	1978	Dallas, TX	Bennie Byler, Mississippi State University
6.	1979	Anaheim, CA	Ronald Brown, Mississippi State University
7.	1980	New Orleans, LA	L. H. Newcomb, The Ohio State University
8.	1981	Atlanta, GA	Maynard Iverson, North Carolina State University
9	1982	St. Louis, MO	Dale Oliver, Virginia Tech State University
10.	1983	Anaheim, CA	Paul R. Vaughn, New Mexico State University
11.	1984	New Orleans, LA	Jimmie G. Cheek, University of Florida
12.	1985	Atlanta, GA	Bob Stewart, University of Missouri
13.	1946	Dallas, TX	Alan A. Kahler, Iowa State University
14.	1987	Las Vegas, NV	Alfred J. Mannebach, University of Connecticut
15.	1988	St. Louis, MO	Edgar P. Yoder, The Pennsylvania State University
16.	1989	Orlando, FL	Michael F. Burnett, Louisiana State University
17.	1990	Cincinnati, OH	Robert A. Martin, Iowa State University
18.	1991	Los Angeles, CA	Larry R. Arrington, University of Florida
19.	1992	St. Louis, MO	John P. Mundt, University of Idaho

Acknowledgments

Successfully organizing any activity as large and complex as the NAERM requires the work and cooperation of a great many people. And while most of the accolades for completing the job successfully will go to the co-chairs of the meeting, we must recall the hundreds of hours of "people time" that have gone into this endeavor, and do our best to say thanks. Therefore, we would acknowledge and express our sincere gratitude to the following people:

..... to John Mundt, who provided leadership to the 1992 meeting and invaluable guidance and advice for the 1993 meeting;

.... to David Lawver, chairman of the 1993 AAAE research committee;

..... to Katherine Fennelly, Head of the Department of Agricultural and Extension Education at The Pennsylvania State University, for providing the needed administrative support for the successful completion of this program;

..... to all members of the profession who submitted research paper proposals and permitted their work to be judged by their peers;

..... finally, and most importantly, a very special thanks to Dorothy Thomas and Jamie Evans, secretaries in the Department of Agricultural and Extension Education at Penn State; without their support and diligent effort the development of these Proceedings would not have been completed in such a timely manner.

Reviewers

David Agnew, Arkansas State
Connie D. Baggett, Penn State
Kirby Barrick, Ohio State
Arthur Berkey, Cornell
Douglas Bishop, Montana State
Blannie Bowen, Penn State
Gary Briers, Texas A&M
Michael Burnett, Louisiana State
Charles Byers, Western Kentucky
Susan S. Camp, SUNY
Richard Carter, Iowa State
Jimmie G. Cheek, U Florida
David Cox, U Arizona
James Flowers, North Carolina State
Martin Frick, Purdue
Stacy Gartin, West Virginia
Steven Harbstreit, Kansas State
Joe G. Harper, Clemson University
Ray Herren, U of Georgia
Don Herring, Texas A&M
John Hillison, VPI & SU
David L. Howell, U New Hampshire
Maynard Iverson, University of Georgia
Barbara Kirby, North Carolina State
Jasper Lee, Mississippi State
Dames Leising, U California--Davis
Al Mannebach, U Connecticut
Robert A. Martin, Iowa State
Max McGHee, U Florida
Wade Miller, Iowa State
John Mundt, U Idaho--Boise Center
Carl Reynolds, U Wyoming
Lou Riesenberg, U Idaho
Rosemarie Rosetti, Ohio State
Michael Rush, Idaho State Department
Glen Shinn, Clemson State
Robert Stewart, U Missouri
Gary Straquadine, Utah State
William Thuemmel, U Massachusetts
George Wardlow, U Arkansas
Robert Warmbrod, Ohio State
Randol Waters, U Tennessee
Edgar P. Yoder, Penn State
Mark Zidon, Platteville, WI

Discussants

David Lawver (TX)
Carl Reynolds (WY)
Blannie Bowen (PA)
Arlen Etling (PA)
John Parmley (KS)
Randol Waters (TN)
Al Mannebach (CT)
Glen Shinn (TX)
Kerry Odell (WV)
Michael Burnett (LA)
David Doerfert (IA)
Leon Schumacher (MO)

Chairpersons

Donald Herring (TX)
Jimmy Cheek (FL)
David Howell (NH)
Larry Arrington (FL)
Max McGhee (FL)
Martin Frick (IN)
Gary Briers (TX)
Tracy Hoover (FL)
Samuel Curtis (PA)
Joe Harper (SC)
Jerry Peters (IN)
David Hall (PA)

Facilitators

James Flowers (NC)
Carol Conroy (PA)
Edward Osborne (IL)
Al Mannebach (CT)
Jasper Lee (MS)
Matthew Baker (CA)
Lou Riesenberg (ID)
Arthur Berkey (NY)
Steve Harbstreit (KS)
Thomas Dormody (NM)
Arthur Bell (NC)
William Annis (NH)

Registration Personnel: David Lawver, H. Robert Terry (TX)

The individuals listed above contributed considerable time and effort to the 1993 NAERM. This contribution of time, energy, and expertise by many individuals across the profession made the meeting a success. We extend our sincere thanks and appreciation to everyone who assisted in making this meeting a worthwhile and stimulating event.

Thomas H. Bruening
1993 NAERM Co-Chair

Dennis C. Scanlon
1993 NAERM Co-Chair

NAERM Second Session
8:30 -10:00 a.m.
Concurrent Session A

Theme: Underrepresented Populations in Agricultural Education

Topic 1: Agriculture, environmental science and the relationship of agriculture to academic courses as perceived by tenth grade students: Comparisons by gender and ethnicity

Speakers: Mhora Newsom-Stewart, H. Dean Sutphin (Cornell University)

Topic 2: Factors related to recruitment and retention of ethnic minority youth in the Ohio 4-H program

Speakers: Joanne Bankston (Kentucky State University)
Jamie Cano (The Ohio State University)

Topic 3: Hispanics in agriculture: Barriers to educational recruitment

Speakers: Timothy Nichols, Clifford Nelson (Washington State University)

Topic 4: Factors influencing minority and non-minority students to enroll in an introductory agriscience course in Texas

Speakers: B. Allen Talbert, Alvin Larke, Jr. (Texas A&M University)

Discussant: David Lawver (Texas Tech University)

Chairperson: Donald Herring (Texas A&M University)

Facilitator: James Flowers (North Carolina State University)

AGRICULTURE, ENVIRONMENTAL SCIENCE AND THE RELATIONSHIP OF AGRICULTURE TO ACADEMIC COURSES AS PERCEIVED BY TENTH GRADE STUDENTS: COMPARISON BY GENDER AND ETHNICITY

Mhora Newsom–Stewart
Post-Doctoral Researcher

H. Dean Sutphin
Chair and Associate Professor

Department of Education
Cornell University

Introduction

This study addresses the issue of student perceptions of agricultural education, including gender and ethnicity differences. In addition, the research investigates perceptions of the relationship between agriculture and other academic subjects. The study is focused on a contemporary curricula problem concerning the integration of academic and vocational subjects.

The findings in this report are part of a comprehensive study which will assist school administrators, teachers and guidance counselors to respond to the New York State Regents Compact for Learning with respect to curriculum development, guidance and career counseling, and to implement a Carl Perkins funded Agriculture Technology Preparation Initiative in the State. This study provides a model for analysis that could be used with other Technology Preparation Projects in Agricultural Education.

The number of agriculture programs and student enrollments have declined in recent years. Krueger and Riesenberg (1991) found that students often have misperceptions of the agricultural industry and agricultural careers. These misconceptions could lead to further enrollment decline unless corrected. To this end, Riesenberg and Lierman (1990) recommended further study of factors affecting enrollment in agricultural education. Unless educators begin to understand current perceptions, they can do little to correct error in judgment, misinformation or lack of knowledge. Gender and ethnicity differences among students' perceptions are also a current concern.

This study is also important and timely because of the current Technology Preparation movement which has a major interest in integrating academic and vocational subjects. This approach is supported by Congress and many educators across the country (Buzzell, 1993). The concept of integration of subject matter explored in this study is related to new concepts of problem solving, decision making and communications (Grubb & Kraskouskas, 1993). Similarly, the nationally acclaimed SCANS report which promotes the concept of high-performance schools (Brock, 1993) provided a conceptual background for this investigation. Underlying socioeconomic, political and status factors are concepts explored in the study. These are all elements of what Hudelson (1993) described as roots of reform in public education pertaining to the workforce.

Theoretical underpinnings for this research are found in the works of Ausubel (1968), Vygotsky (1962) and Bandura (1986). These theories are based in cognitive psychology and developed from a constructivist perspective with respect to curriculum development. Appropriate concepts for this research were drawn from their work as well as developmental theories from an ecological perspective such as that of Bronfenbrenner (1979).

Purpose and Objectives

The purpose of this investigation was to develop a knowledge of tenth grade students' perceptions of agriculture, environment and the relationship of academic and agricultural courses in order to develop an effective curriculum design and recruitment strategy that provides equitable program access for all high school students. The research objectives were to:

1. Determine the perceptions of tenth grade students concerning agriculture and environmental science and the strength of these perceptions.

2. Determine the differences by gender and ethnicity in the perceptions of tenth grade students concerning agriculture and environmental science.

3. Identify tenth grade student perceptions of the relationship between agriculture and other academic courses.

4. Identify recommendations for recruiting students and developing curriculum that would attract a diverse student body to study agricultural education.

Procedures

The population consisted of tenth grade students in twelve schools and technical centers geographically distributed across New York State. The schools were pilot centers in a Technology Preparation Project. The school selection process was designed to identify schools that were representative of schools within the State in terms of high schools in urban and rural areas, schools with and without agricultural education in the curriculum, and central high schools and technical centers (Boards of Cooperative Educational Services typically referred to as BOCES). The selection panel to identify schools included representation from Deans of Agriculture in two–year colleges, the New York State Rural Schools Program, public school administrators, and the State Department of Education. All schools in the sample had a tenth grade cohort with the exception of one BOCES Center. Since one of the feeder schools to this BOCES was in the project, this technical center was represented in the data set. There were 1253 respondents.

The schools were contacted in early November 1992 to solicit cooperation, identify school contact persons and to determine the number of students in the tenth grade. Tenth grade students were selected because they would be the first class to enroll as juniors in a Technology Preparation Program. A packet of instruments was mailed to each contact person in early January along with standardized instructions on how to administer it to the students. A representative statistically significant sample of tenth grade students from each school completed the instrument based on the size of the tenth grade class. The school contact assigned each student a number to identify the research instruments and to assure respondent anonymity. Similarly, the schools were coded by number. Completed surveys were mailed to Cornell University. All schools complied with the data collection procedures.

Instrumentation

The researchers developed a Career and Educational Interest instrument to address the research objectives. The instrument consisted of two separate forms: Form 1, Home and School and Form 2, Agriculture and Technology Preparations. The instrument and data collection procedures were field tested in spring 1992. Field test reliability for subscales for agriculture, environment science and the relationship of agriculture and academic courses was .81, .83 and .90, respectively. In addition, a panel of experts determined that the instruments were content valid. Based on pretest results the questionnaires were revised as necessary.

During fall 1992 the revised instrument was submitted to a commercial vendor to convert to opscan format. This provided an easy to follow, self-contained booklet that had a professional appearance. It also transformed the instrument to machine readable form that could be quickly scanned to a data file. The final questionnaire consisted of Likert type scales using a strongly disagree to strongly agree scale. The survey also collected nominal level data. The final survey was administered to students during fall and spring 1993. Reliability coefficients of the final instrument were similar to those of the initial field test.

Analysis of Data

Data was analyzed using SPSS on the PC. Frequencies were obtained on all data. Scale results were summarized using means and standard deviations. In order to calculate means and standard deviations on scales, interval level data were assumed to be equally spaced. Comparisons of means of both scales and individual items were calculated using analysis of variance or t-tests. Duncan's least significant difference was calculated to identify the groups which differed in cases when significant differences were found.

Results

Perceptions of Agriculture

Respondents rated their agreement and disagreement with respect to 14 potential perceptions of agriculture on a Likert–type scale of 1 strongly disagree to 5 strongly agree. Subscales of the instruments were subjected to factor analysis to ascertain the conceptual categories.

The mean scores of the 14 descriptors of agriculture among high school tenth grade students ranged from 2.3 to 4.0. Three of the mean scores were 3.5 or higher as shown in Table 1. These more popular descriptors were "important to the economy" (X=4.0), "important to the future" (X=4.0) and "important to society" (X=3.9). The narrow descriptor of "important only to farmers" only received a mean score of 2.3, lowest of all the fourteen items.

Table 1
Perceptions of Agriculture and Environmental Studies as Perceived by Tenth Grade Students

	Agriculture		Environmental	
Items	X	SD	X	SD
Important to the economy	4.0	.86	3.8	.86
Important to the future	4.0	.89	4.1	.86
Important to society	3.9	.84	4.0	.81
Business oriented	3.4	.90	3.3	.86
Rough, outdoor work	3.4	.97	3.1	.90
Politically important	3.3	1.02	3.6	.96
A good way to make money	3.3	.94	3.2	.88
A place for high school graduates to work	3.3	.93	3.2	.91
A good career	3.1	1.01	3.4	.86
High tech	3.3	.91	3.5	.86
Something anyone can do	3.0	1.08	3.1	1.03
High status	2.9	.89	3.2	.84
A place for college graduates to work	2.9	1.04	3.5	.91
Only important for farmers	2.3	1.07	2.3	1.00

Note: Based on scale 1=Strongly Disagree to 5=Strongly Agree

Perceptions of Environmental Science

The same 14 descriptors used for agriculture were repeated again for environmental science. Students rated their perceptions for environmental science. The mean scores among high school tenth grade students ranged from 2.3 to 4.1. Four of the mean scores were 3.5 or higher as shown in Table 1. These more popular descriptors were "important to the future" (X=4.1), "important to society" (X=3.9), "important to the economy" (X=3.8), and "politically important" (X=3.6). Similar to results of perceptions of agriculture, the narrow descriptor of "only important to farmers" received a mean score of 2.3. These results are shown in Table 1.

Relationship of Agriculture to Other Academic Courses

Students indicated with means of 2.8 or higher on a five point Likert–type scale a relationship between agriculture and their academic courses. Students highly rated agriculture examples as a good way to understand science and vice versa (X=3.5). By comparison, using math to understand agriculture was rated less highly (X=3.1) and the reverse relationship even lower (X=2.9). The use of agricultural examples to understand communication and computer skills and vice versa were rated between 2.9 and 3.1. Significant differences in the perceptions of the use of agricultural examples to understand math were detected (p=.02). Caucasian students rated this relationship higher than Hispanic students.

Gender Differences on Perceptions of Agriculture and Environmental Science

The T-Test was used to compare the perceptions of male and female students at the .05 alpha level. There were no significant differences by gender for agriculture or environmental science.

Ethnicity Differences on Perceptions of Agriculture and Environmental Science

The Analysis of Variance was used to compare the perceptions of Black, White, American Indian or Alaskan Native, Asian of Pacific Islander and Hispanic students at the .05 alpha level. A significant difference (P=.02) was found for agriculture. Asian and Hispanic students had a lower perception of agriculture in comparison with Caucasians in this study. The same significant differences among groups exists for the perceptions of Environmental Science (P=.001).

Individual items within the scales were also examined for gender and ethnicity differences. These results are shown in Table 2.

Females rated "Important to the Economy" a better descriptor of both agriculture and environmental science than males. Similarly Whites rated this descriptor more highly than Hispanics.

Ethnic differences were also detected in the perceptions of both agriculture and environmental science for "Important to the future," "A place for high school graduates to work," "high tech," and "A place for college graduates to work." White students generally rated these descriptors higher than other ethnic groups.

Gender differences were also detected at p=.05 alpha in the perceptions of both agriculture and environmental science for "A place for high school graduates to work" (males higher) and "Only important for farmers" (males higher).

Table 2
Item Analyses of Gender and Ethnicity Difference of Perceptions of Agriculture and Environmental Science

Items	Agriculture		Environmental Science	
	Gender	Ethnicity	Gender	Ethnicity
Important to the economy	.0229	.0151	.0165	.0044
Important to the future	--	.0046	.0009	.0131
Important to society	--	--	.0006	--
Business oriented	--	--	--	.0009
Rough, outdoor work	--	--	--	--
Politically important	--	.0000	--	.0000
A good way to make money	--	--	.0134	.0114
A place for high school graduates to work	.0062	.0000	.0121	.0033
A good career	--	--	--	.0157
High tech		--	.0020	--
Something anyone can do	--	--	--	--
High status	--	--	--	--
A place for college graduates to work	--	.0009	--	.0002
Only important for farmers	.0018	--	.0002	--

Note: Based on scale 1=Strongly Disagree to 5=Strongly Agree

Conclusions and Recommendations

1. Generally, tenth grade students have an understanding of the fields of agriculture and environmental science.

2. There are no significant differences in the how male and female students perceive the integration between agriculture and other academic courses. However, an analysis by ethnic background determined that White students rated this relationship higher than Hispanic students (p=.02). Students generally felt agriculture was most closely related to science followed by mathematics, communication and computers.

3. White students felt the descriptors were more applicable to their perceptions of agriculture and environmental science than Asian or Hispanic Students.

4. Scale examination indicated no significant differences between how male and female students at the tenth grade level perceive agriculture and environmental science. However, when individual items were examined significant differences were detected for six out of fourteen items.

5. Agriculture teachers, administrators, and guidance counselors should consider students' perceptions of agriculture and environmental science during curriculum design and implementation. Curriculum should be designed and described in a manner that encourages students to enroll in courses.

6. Recruitment strategies for elective courses in agriculture should be sensitive to gender even though there was limited significant differences in their perceptions of agriculture and environmental science.

7. Curriculum development of agriculture programs should consider equity matters with respect to culture and consider cultural differences in perception when recruiting students and designing curriculum for a multicultural student body.

8. Further research should be conducted to examine cultural differences concerning perceptions of agriculture and environmental science.

9. More in depth qualitative analyses would be useful in further probing existing gender and ethnicity differences in perception of agriculture and environmental science and in elucidating possible explanations for existing differences. Additionally, qualitative analyses would assist educators in developing curriculum which could take these differences into account.

Bibliography

Ausubel, D. P. (1968). Educational psychology: A Cognitive View. New York: Holt, Rinehart and Winston.

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. New Jersey: Prentice Hall.

Brock, W. E. (1992, October). A vision for education. Vocational Education Journal, p. 21-22, 68.

Bronfenbrenner, U. (1979). The ecology of human development: Experiments by nature and design. Cambridge, MA: Harvard University Press.

Buzzell, C. (1993, February). Assisting a new administration. Executive Directions. Vocational Education Journal, p. 10.

Grubb, W. N. & Kraskouskas, E. (1993, February). Building bridges: How postsecondary institutions are integrating academic and vocational content. Vocational Education Journal, pp. 24-25, 50.

Hudelson, D. (1993, February). The standard approach. Vocational Education Journal, pp. 32-34, 51.

Krueger, D. E. & Riesenberg, L. E. (1991). Careers in agriculture as perceived by high school juniors and seniors. Proceedings of the Eighteenth Annual National Agricultural Education Research Meeting (pp. 63-69). Los Angeles, December 6, 1991.

Riesenberg, L.E. & Lierman, S. R. (1990). Perceptions of administrators and instructors concerning factors influencing secondary agriculture enrollment. Journal of Agricultural Education, 31(2), 7-11.

Vygotsky, L. S. (1962). Thought and language. Massachusetts Institute of Technology.

AGRICULTURE, ENVIRONMENTAL SCIENCE AND THE RELATIONSHIP OF AGRICULTURE TO ACADEMIC COURSES AS PERCEIVED BY TENTH GRADE STUDENTS: COMPARISON BY GENDER AND ETHNICITY

A Critique

David E. Lawver, Texas Tech University -- Discussant

The objectives of this study were to determine perceptions of tenth grade students concerning agriculture and environmental science, to determine differences in those perceptions based on gender and ethnicity, to identify perceptions of the relationship between agriculture and other academic courses, and to identify recommendations for recruiting and curriculum development for a diverse student population. This research deals with an important topic -- determining what students think about agriculture, environmental science, and the relationship of agriculture to academic courses. As we strive to serve a representative segment of the population, it is important to identify gender and ethnic differences on these aspects of secondary education.

The introduction of the paper provides the needed background information to justify a study of this nature. The literature review appears to be adequate in that it provides a sound theoretical framework from which the objectives of this study were derived.

The researchers have provided an excellent description of the procedure used to identify the schools which were included in the population. The sampling technique could be better described. The researchers reported that there were 1253 respondents. It is also mentioned that a "statistically significant sample" from each school responded. How were these selected? What was the response rate? Was random sampling used? Answers to these questions would allow the reader to make judgments concerning the generalizability of the results.

A very detailed description of the instrumentation development is provided in this manuscript. The instrument was field tested and reliability coefficients were reported. A panel of experts was used to validate the instrument, however, the panel of experts was not described in the paper. After field testing and validation the instrument was converted to a machine readable format. Could this affect validity? The researchers reported that the reliability coefficients remained similar.

In the results section of the paper, the results dealing with perceptions of agriculture, environmental science, and relationship of agriculture to other academic courses was easy to understand because means and standard deviations were reported. Table 2, which addresses gender and ethnic differences, was difficult to understand. The table is not labeled. Therefore it is difficult for the reader to make judgment concerning the results of the study. I think the table is reporting probabilities. If this is so, then means, standard deviations, and t-scores would greatly enhance the meaningfulness of the table.

The final objective of the deals with recruitment and curriculum development strategies for a diverse student population. Because of this objective, I expected to see some results reported that dealt directly with these problems. The researchers made recommendations concerning recruitment and curriculum development. I am not sure that these recommendations are supported by the findings.

The results of this study provide evidence that can be useful in understanding what students think about agriculture, environmental science, and the relationship be agriculture and academic courses. Given limitations on number of pages for this publication, I am sure that some information was left unreported. It would be interesting to have access to a more complete report.

FACTORS RELATED TO RECRUITMENT AND RETENTION OF ETHNIC MINORITY YOUTH IN THE OHIO 4-H PROGRAM

Joanne Bankston
Director
National Center For Diversity
Kentucky State University

Jamie M. Cano
Associate Professor
Department of Agricultural Education
The Ohio State University

Introduction

Ethnic diversity is growing in America. By the 21st century, one-quarter to one-third of all Americans will belong to racial or ethnic minorities (Allen & Turner, 1990). 4-H, as one of the largest, informal youth education efforts in the United States will be challenged to serve an increasingly diverse population of cultural, racial, and ethnic backgrounds represented among families, communities and states. Data for the Ohio 4-H program indicated that minority youth in Ohio were being served by 4-H; however, evidence existed that Ohio 4-H involved minority youth disproportionately throughout the state, and at a lower percentage than youth being served nationally (1991 Ohio 4-H Statistical Results). Indeed, a problem existed in identifying effective efforts and strategies utilized to make 4-H programs accessible to all populations.

Recruitment and retention of minority youth in the 4-H program will become an increasing concern as the minority youth population continues to grow at a faster rate than that of white youth. Extension staff will continue to search for ways to serve undeserved minority youth. Clearly, additional information on successful recruitment and retention strategies for involving minority you in the Ohio 4-H program can provide significant insight in proposing future strategies.

Conceptual Framework

Many factors impact youth participation in programs. Warner (1965) found that personal factors; social and environmental factors; and, organizational factors affect youth participation in voluntary groups. The changing characteristics of youth also offer implications for programming. Growth in the youth population, changes in racial diversity, family structure and living arrangements, urbanization, children in poverty, and the increasing number of working mothers impact programming in voluntary youth organizations (Cook, 1988).

Public awareness and the image of an organization is closely related to an organization's utilization. Warner and Christensen (1984) found that Blacks and other minority groups, low income persons, and urban residents reported substantially less knowledge of 4-H than other population groups. Cano and Bankston (1991) reported that minority youth and parents had limited knowledge of 4-H until personal contact was made. Minority youth and parents also perceived 4-H as an organization for rural white youth with farm animals (Cano & Bankston, 1991).

Marketing and communication activities are important in informing minority youth about the 4-H program and encouraging them to join. Diem (1987) found that key marketing activities such as long term planning, identifying and targeting audiences, and consideration of the needs and interests of potential audiences were generally not used in promoting 4-H. Media methods and messages greatly impact minorities. The importance of the inclusion of positive minority media images in both print and broadcast media (including publications) is essential to the marketing of programs (Wilson & Gutierrez, 1985).

Volunteer leaders can provide significant influence in involving youth in 4-H. Cano and Bankston (1991) concluded that minority parents and other relatives were involved with 4-H as leaders, assistants and agents. Personal contact with persons involved in 4-H as a volunteer, an employee, or a friend was one of the most instrumental means of influence for involving minority youth (Cano & Bankston, 1991). Volunteers also serve as compelling role models in influencing kids (Sheppard & Sherrard, 1977).

Parental support, interest in activities, and recognition of achievement were important in retaining youth in 4-H programs (Hartley, 1982). Minority youth often drop out of 4-H because, they get jobs, project materials become too costly, and they loose interest (Cano & Bankston, 1991).

Purpose and Objectives

Thirty-one of Ohio's 88 counties with a minority population of 3% and greater were studied. All objectives relate to the 31 counties. The objectives of this descriptive survey study were:

1. To determine the communications and marketing strategies utilized by county Extension personnel to recruit ethnic minority youth in the Ohio 4-H program, and to describe the degree of success experienced with recruitment activities.

2. To describe the types of strategies utilized by county Extension personnel to retain ethnic minority youth in the Ohio 4-H program and to describe the degree of success experienced with retention strategies.

3. To identify county personnel's perceptions of their success in recruitment and retention of ethnic minority youth in the Ohio 4-H program.

4. To determine the relationship between the number of minority county Extension professionals and the enrollment of minority youth in Ohio 4-H.

5. To determine the relationship between the number of ethnic minority volunteers and minority enrollment in Ohio 4-H.

Procedures

Population and Subject Selection

The population for this study consisted of 31 of Ohio's 88 counties that have a minority population of 3% or greater as defined by Statistical Abstracts (1988). The county Extension professional who had the greatest percentage of their time dedicated to working with minority youth was surveyed. An accurate frame was secured from the Ohio Cooperative Extension Service state office. A census of the 31 counties was conducted.

Instrumentation

A mail questionnaire was developed to collect data from 4-H professionals in the study. The descriptive survey utilized an instrument that had a Likert-type scale and open-ended questions. Eighteen recruitment and 14 retention strategies specifically designed for minority youth were identified through a review of literature. The Likert-type scale measured the level of frequency and degree of success for recruitment and retention activities. Other questions were included that captured the Extension professionals' perception of success in involving minority youth.

The instrument was reviewed by a panel of experts to assess content and face validity. A test-retest procedure was used to pilot test the instrument for reliability. The pilot test was administered to 4-H agents in Kentucky who represented a similar population to Ohio 4-H agents.

Results

Recruitment

Presentation to school classrooms or assemblies where minorities were in attendance was the marketing and communications strategy most frequently used by county Extension professionals to recruit minority youth. Use of school programs received the highest mean score (3.52) of the 18 activities and was interpreted as being used "often." Placing promotional brochures or flyers in minority communities (mean = 2.81), and enlisting minority community leaders to serve on boards (mean = 2.52) had been used "some." Most (15) of the recruitment activities had been utilized a "little" or not at all. The least used activities were submitting newspaper articles to minority newspapers; publicizing on minority radio stations; and radio programs that include minority youth. Minority newspapers and radio stations were available in most of the larger urban counties.

On the average, none of the recruitment activities were found to be very successful or extremely successful in recruiting minority youth in 4-H. However, involving minority 4-H leaders to recruit minority youth was the activity experiencing the largest degree of success (mean = 2.91) and interpreted to be "moderately successful." Six other recruitment activities were identified as receiving a moderate degree of success for counties that had utilized the activity. Each activity received a mean score of 2.50 or above. The activities included: presentation to school classrooms and assemblies; submitting articles to minority newspapers; presenting promotional programs in minority churches; involving minority parents to recruit minority youth; publicizing 4-H in minority newspapers; and use of questionnaires and discussions to determine the needs and interests of potential minority 4-H program participants. Of the 18 activities listed, the least successful activities were publicizing 4-H on radio stations most frequently listened to by minorities and publicizing through cable TV programs with minority youth in the photos.

Retention

The two most frequently used retention strategies (interpreted as being used "often") were: made minority youth and leaders feel welcome at events (mean = 3.74) and recognized achievement (mean = 3.68). Other activities frequently used (interpreted as being used "some") were: held meetings at convenient locations and times; used a variety of activities; and, recognized minority leaders for time and service.

The least used retention activities (interpreted as being used "little") included: found ways to make meetings interesting to minority youth and researched incentives that interested minority youth.

Most (12) of the retention activities were found to be moderately successful by counties that had utilized the activity. The two most successful retention strategies ranked by mean score were: recognized minority volunteer leaders for time and service (mean = 3.36) and recognized achievement (mean = 3.28). The two activities interpreted as being only slightly successful were: developed programs and interest minority youth and researched ideas for programs that interest minority youth.

Agents' Perception of Success

The largest percentage of county Extension professionals (58.1%) indicated that they had not been very successful in involving minority youth. Findings indicated that the most important reason why minority youth remained in the 4-H program was because their friends were involved. Youth also remained in the program, because a leader or parent encouraged them to stay involved. 4-H professionals indicated that the two most important reasons why minorities have not remained in 4-H were: parents do not support the program and minorities lack interest in 4-H. Factors mentioned that might enhance recruitment and retention were: an increased number of volunteers, expansion of program and field staff, and increased number of minority volunteers and field staff, more culturally sensitive media support and materials, more professionally produced marketing materials, and increased financial support.

Of the 57 Extension professionals working with minority youth in 31 counties, 79% were Caucasian, 19% were African American, and one professional (2%) was Asian. A correlation coefficient of .92 suggested that there is a strong tendency for counties with a larger number of minority employees to have a larger number of minority youth enrolled in the 4-H program. A very strong positive association (r=.92) was also found between the number of minority volunteers and the number of minority youth enrolled.

Conclusions

The most frequently utilized recruitment activity was use of school programs. Several advantages and disadvantages exist. Presentations to classrooms require less targeted effort and time, while exposing a larger number of the general population, but fail to expose youth to many dimensions of the program.

Since many of the recruitment activities had only been used a "little" or "not at all," several explanations might be given. Limited use of the activity may have resulted because the activity required knowledge of the availability of the resource (such as minority newspapers and radio stations); require considerable time and effort to access; and may only be available in urban areas.

Retention strategies most frequently utilized involved personal interest and recognition for youth and leaders. Counties should continue to make leaders feel welcome at events and recognize youth achievement.

Similar factors were repeatedly mentioned that impede success with recruitment and retention. Recruitment of more minority leaders and program staff, providing more financial support for programs and materials, making programs more relevant to minority youth, and professional assistance with media were essential factors for involvement of minority youth.

Since over half (51.8%) of the Extension professionals perceived that they had not been very successful or not successful at all in involving minority youth, it is important to identify reasons for the lack of success. Evidence exists that county Extension professionals need additional training on methodologies helpful in recruiting minority youth since some felt that minorities do not respond to the usual recruitment techniques. Limited time and personnel again hamper recruitment and retention efforts.

Personal influence and contact with the individuals who are close to minority youth cannot be underestimated and must be emphasized and promoted. Agents perceived that minority youth remained in the program, because their friends were involved, or a leader or parent encouraged them to stay involved. Similarly, the lack of personal influence affected the program adversely. If parents do not support the program, then youth will not remain involved. The influence of personal contacts presents a compelling argument for increased promotion to minority youth, parents, and potential leaders. Promotion of 4-H to minorities will of necessity employ marketing techniques designed to target the minority population.

Minority Extension professionals were quite successful in involving a large number of minority youth in the 4-H program. Hiring of more minority Extension professionals may increase enrollment of minority youth. Further attention should also be directed to the positions for which minority staff are hired. More minorities should be represented in administrative positions, as minority administrators serve as role models to field staff, parents, and youth.

Recommendations

Recommendations suggested that recruitment of minority youth will require targeted marketing efforts directed toward the needs of minority youth by Ohio Cooperative Extension. Since minority Extension professionals have been successful in involving more minority youth, hiring of more minorities may increase enrollment. It was also recommended that Ohio Cooperative Extension recruit more minority volunteers, both minority and non-minority; advertise and publicize the program through minority media, and the minority community; and train existing staff on techniques for marketing 4-H to minorities.

References

Allen, P.A. & Turner, E. (1990, August). Where diversity reigns. American Demographics, pp. 34-38.

Cano, J. & Bankston, J. (1992, Spring). Factors which influence participation and non-participation of ethnic minority youth in Ohio 4-H programs. Journal of Agricultural Education, 23-29.

Cook, A. K. (1988, June). Our children, our future (WREP-103). Corvallis, OR: Oregon State University, Western Rural Development Center.

Diem, K. G. (1987). The relationship of marketing activities and promotional methods used with county 4-H club membership in New Jersey and Ohio. Unpublished doctoral dissertation. The Ohio State University, Columbus, OH.

Ohio Cooperative Extension Service (1991). 1991 Ohio 4-H statistical results. Columbus, Ohio.

Sheppard, N. A. & Sherrard, F. (1977, March). National Conference on increasing the participation of Black Americans in vocational education: Proceedings of a national conference. VPI and the Division of Vocational Education, State Department of Education. Blacksburg, VA.

Warner, P. D. & Christenson, J. A. (1984). The Cooperative Extension Service: A national assessment. Boulder, CO: Westview Press.

Wilson, C.C. & Guiterrez, F. (1985). Minorities and media: Diversity and the end of mass communications. Newbury Park, CA: Sage.

FACTORS RELATED TO RECRUITMENT AND RETENTION OF ETHNIC MINORITY YOUTH IN THE OHIO 4-H PROGRAM

A Critique

David E. Lawver, Texas Tech University -- Discussant

This research on recruitment and retention of ethnic minority youth in Ohio 4-H dealt specifically with communications and marketing strategies for recruitment, strategies for retention, county personnel's perception of their recruitment and retention success, the relationship between the number of minority county Extension professionals and enrollment of minority youth, and the relationship between the number of minority volunteers and minority enrollment. The researchers are striving to explain the under representation of ethnic minority youth in Ohio 4-H programs. This research further looks at current efforts at recruiting and retaining ethnic minorities. 4-H programs have much to offer all youth. The under representation of minority youth is disturbing considering the potential good that can be accomplished in 4-H.

The introduction for this paper provides an excellent theoretical framework which guided the formulation of the objectives for this study. The introduction is well written, concise, and complete. After reading the introduction there is no doubt as to what will be addressed in the body of the manuscript.

The Procedures used for in conducting this study appear to be appropriate. The researchers adequately justify the use of only 31 of 88 counties because of minority population. Questionnaire development appears to have been conducted appropriately. A panel of experts (who were the experts?) was utilized for content and face validity. Reliability was addressed with a test-retest procedure during the pilot test with 4-H agents from another state. No coefficient of stability was reported.

Tables, charts, and graphs are always helpful when reading research reports. The authors have done an excellent job in reporting their results. The use of table or other graphic would greatly enhance the meaningfulness of the manuscript.

The researchers have made conclusions and recommendations that are appropriate and on target. All seem to be within the scope of the study.

The researchers have taken great care from start to finish in conducting this study. This research report has quantified some very important information concerning the recruitment and retention of ethnic minority youth in 4-H programs in Ohio. The recommendation to hire more minority professionals and to recruit more minority volunteers is important. This research should lead to further study and program development which has the potential for making meaningful differences.

HISPANICS IN AGRICULTURE: BARRIERS TO EDUCATIONAL RECRUITMENT

Tim Nichols, Assistant to the Director of Academic Programs
Clifford Nelson, Professor of Agricultural Education
College of Agriculture and Home Economics
Washington State University

Introduction

Between 1980 and 1990, the Hispanic population in the U.S. increased by 53%--from 14.6 million to 22.4 million. This is five times the growth rate of the rest of the population. Washington state had the nation's third fastest growth rate at 79% (U.S. Bureau of the Census, 1991). Although Hispanics are the fastest growing subgroup, they remain the least educated segment of the American population today. Nationally, only 10% of Hispanic high school graduates attend college, compared to 21% of non-Hispanics (Hickey & Solis, 1990).

Enrollment is a major concern for colleges of agriculture across the country, where numbers of baccalaureate graduates have sharply declined since their peak in the late 1970's (U.S. Department of Education, 1992). Ironically, during this era of declining enrollments, the job market for agriculture college graduates has improved. A 10-15% shortage of professionals is predicted in many sectors of the industry (Coulter, Goecker & Stanton, 1990). Hispanic students comprise an even smaller share of agriculture enrollments than they do in most other collegiate programs. Seemingly, Hispanics' considerable experience in agriculture has served not as a motivator for them to pursue this major in college, but rather to intensify the already negative perceptions held by the general public.

An established conceptual framework for barriers to higher education was not evident in the literature. However, a synthesis of the literature found several potential barriers which result in Hispanics being underrepresented in higher education. These include: finances, mobility, academic preparation, lack of knowledge of the system, culture and family, and a lack of encouragement and support (Hickey & Solis, 1990; Romo, 1984). Either together or separately, these barriers have been suggested to impede Hispanics' participation in higher education.

Virtually all studies of barriers identify economic factors as significant predictors of participation in higher education. As a subgroup of the American population, Hispanics are at or near the bottom of the socioeconomic ladder. The day to day realities of poverty move higher education down the family's priority list. Soaring tuition costs and change in financial aid programs from grants to loans intensify this barrier. Financial barriers are compounded by a lack of knowledge of "the system"--scholarships, financial aid, loans, etc. (Romo, 1984)--and by the families' traditional reliance on their children's earnings as a significant share of total family income (Hickey & Solis, 1990).

With students' earnings so closely tied to family well-being, mobility also becomes a barrier. First, most Hispanic students cannot afford transportation to and from college. Second, those whose families are involved in migrant farm labor, or who are frequently pulled out of school for work, suffer from a lack of educational continuity and find themselves ill-prepared to even graduate high school. Lack of academic preparation is cited repeatedly as a barrier; many Hispanic students suffer from a lack of English proficiency, and vocational tracking which results in them not fulfilling subject matter requirements for many universities (Garza-Lubeck & Chavkin, 1988).

Obligations and connections to family are common barriers to Hispanics participating in education (Wirsching & Stenberg, 1992). Common cultural expectations for Hispanic men are that they will work and help support the family; women are expected to stay at home, help with field work, care for younger siblings, and do household chores (Hickey & Solis, 1990). Romo's study (1984) compared recent immigrant, transitional (lived in U.S. 5 years or more) and Chicano (U.S. born of Mexican ancestry) families. Results showed that recent immigrants valued education but had lower expectations of schooling, and were thus likely to perceive more barriers to higher education. As Hispanics become more acculturated they experience fewer barriers to higher education (acculturation is the process of cultural change in which continuous contact between culturally distinct groups results in one group taking over elements of the other group, Wirsching & Stenberg, 1992). However, many still fear that attending college would mean severing ties with family, home, language and culture (Romo, 1984). They suffer further from their parents' lack of experience, understanding and valuing of education, and a deficit of role models who have succeeded in higher education (Hickey & Solis, 1990). Low expectations, and a lack of encouragement from high school teachers and counselors further curtail Hispanic student matriculation at the nation's colleges and universities (Rendon & Amaury, 1988).

For colleges of agriculture, these general barriers faced by Hispanics are compounded by the industry's negative image. Research has shown that most high school students perceive agriculture as simply farming; equating it with hard, physical, seasonal labor offering few economic rewards, and little opportunity for advancement (Orthel et al, 1986; Hoover & Houser, 1991).

No studies were found which specifically explored Hispanic students perceptions of agriculture. One project comparing inner-city students found no difference in perceptions between white and minority youth (White, Stewart & Linhardt, 1991). Flores and Kellogg (1989) said minority students generally perceive agriculture as an industry that requires an unskilled workforce, and careers that lead to economic instability. Other authors contend that experience as poorly paid farm laborers have led to a desire amongst most college-bound minorities to seek "something more" than agriculture (Bowen, 1987; Trotter, 1988). Three Washington State University Hispanic students concurred saying that "agriculture was something you left behind when you came to college."

Purpose/Objectives

Several questions remain: Do Hispanic students perceive more or different barriers to higher education than Non-Hispanics? Do Hispanics perceive agriculture differently than their non-Hispanic counterparts? What influence does acculturation have on perceptions of agriculture and barriers to higher education? Ultimately, why are Hispanics underrepresented in college agriculture programs? These questions were addressed by testing the following null hypotheses:

Hypothesis 1: There is no significant difference in barriers to participation in higher education between Hispanics and non-Hispanics.

Hypothesis 2: There is no significant difference in perceptions of agriculture between Hispanics and non-Hispanics.

Hypothesis 3: There is no significant difference in barriers to higher education based upon respondents' acculturation.

Hypothesis 4: There is no significant difference in perceptions of agriculture based upon respondents' acculturation.

Procedures

The target population consisted of Hispanic and non-Hispanic high school agriculture students in central Washington. A purposeful sampling technique was used. Seven schools were selected in communities with especially high concentrations of Hispanics. Vocational agriculture teachers at each of the schools guided the researcher in identifying classes that reflected a balance of grade, gender, and ethnicity. In these classes, all students were sampled. From these schools, 176 students constituted the sample. The sample was composed of 45.1% Hispanics and 54.9% non-Hispanics. Table 1 provides further demographic information on the sample.

Agriculture classes were chosen for a number of reasons. First, based on research and the researchers' personal experiences, high school agriculture students represent a large pool of prospective college agriculture students. Participants in these classes have already expressed some (however slight) interest in agriculture. Second, little is known about Hispanics in agriculture classes.

A researcher-designed questionnaire was used to gather data. The portions of the questionnaire reported in this study consisted of three sections: barriers to higher education, perceptions of agriculture, and degree of acculturation. Barriers to higher education were measured using a scale consisting of numerous statements generated through a review of the literature and personal interviews of Hispanic college students. Multiple items were generated for each type of barrier. A total of 30 items resulted. Items were arranged in random order with half of the statements worded in a positive manner (e.g., "My high school counselor encourages me to attend college"), and half in a negative manner (e.g., "I cannot afford to attend college"). Each item was ranked on a five point Likert scale from 1=strongly agree, to 5=strongly disagree. The instrument was reviewed by a panel of students and faculty to establish face validity. After data were collected, a Cronbach's alpha test was run to assess internal consistency of items measured in the scale. A relatively high alpha reliability coefficient of .83 resulted for this scale. The second scale, perceptions of agriculture consisted of 23 items and was also developed through a review of literature and interviews with Hispanic students. Researchers made an effort to include items which were culturally sensitive to Hispanics' experience in agriculture; for example, one item states "Working in agriculture is often unsafe because of chemicals and possible accidents." As with the barriers scale, half of the items were stated in a positive manner (e.g., "You can be your own boss in agriculture), and half in a negative manner (e.g., "Agriculture requires mainly manual labor"). A Likert scale identical to the barriers scale was created. A relatively high Cronbach's alpha reliability coefficient of .82 was computed for this agriculture perceptions scale. The third measure, degree of acculturation was a modification of an existing instrument called the Acculturation Rating Scale for Mexican-Americans (ARSMA). The modified scale included eight questions concerning place of birth, language use and familiarity, reading and writing, and ethnic identity.

Analysis of Data

For hypotheses one and two, subjects were divided into Hispanic and non-Hispanic subgroups and total barriers and perceptions scores were computed by summing the individual items in each of the scales. Groups were compared using frequencies, means and t-tests. Separate Mann Whitney U tests were then run comparing Hispanics and non-Hispanics on each individual barrier and perception item. Hypotheses 3 and 4 utilized multiple Kruskal-Wallis one-way analyses of variance to test barrier and perception scale totals against eight acculturation items.

Results

To test the first hypothesis, the mean total barrier score for Hispanics was 101.494 (SD = 13.912) in contrast to a higher mean score (reflecting fewer barriers) of 105.604 (SD = 13.290) for non-Hispanics. A t-test found these scores to be significantly different ($t = -1.984$, $p < .05$) indicating that the cumulative barriers to higher education are perceived as significantly greater by Hispanics.

Table 1

A Comparison of Hispanic and Non-Hispanic High School Students (n=175)

	Hispanic (n = 79)				Non-Hispanic (n = 96)			
Characteristic	n	%	M	SD	n	%	M	SD
Age	74		16.05	10.01	93		15.88	2.87
Gender								
Female	33	42.3			38	39.6		
Male	45	57.7			58	60.4		
G.P.A.	56		2.76	2.77	80		2.87	.55
How long lived in U.S.								
Entire life	47	60.2			89	92.7		
> 10 years	14	18.0			5	5.2		
5-10 years	6	7.7			0	0.0		
2-5 years	7	9.0			1	1.0		
< 2 years	4	5.1			1	1.0		
Family size								
1-2 people	3	3.8			4	4.3		
3-5 people	35	44.9			70	72.9		
6-8 people	27	34.6			17	17.7		
> 8 people	13	16.7			3	3.1		
Plans after high school								
Work	8	10.4			4	4.3		
2 year college	23	30.0			20	21.5		
4 year college	22	28.6			32	34.4		
Military	7	9.1			7	7.5		
Unsure	17	22.1			30	32.3		
Mother's education								
< High school	57	74.0			16	18.2		
H.S. graduate	13	16.9			29	33.0		
Some college	5	6.5			28	31.8		
College graduate	2	2.6			15	17.0		
Father's education								
< High school	52	75.4			9	10.7		
H.S. graduate	7	10.1			23	27.4		
Some college	6	8.7			34	40.5		
College graduate	4	5.8			18	21.4		
Mother's occupation								
Homemaker	25	35.7			27	30.7		
Farm labor	22	31.4			0	0.0		
Other blue collar	18	25.7			38	43.2		
Professional	5	7.1			23	26.1		
Father's occupation								
Farmer	4	6.9			15	19.2		
Farm Labor	33	56.9			7	9.0		
Other blue collar	15	25.9			33	42.3		
Professional	2	3.4			19	24.2		
Other/Unemployed	4	7.0			4	5.1		

Separate Mann Whitney U tests were run on each of the 30 barrier items in the scale. For eight of the items, there were significant differences between Hispanics and non-Hispanics. In each of these cases, the item represented more of a barrier to Hispanics than non-Hispanics. Five of the items were significant at the .05 level. These included: lack of understanding of how to apply for admission, an unclear picture of what college life would be like, guilt about leaving family to attend college, fear of losing culture, and fear of not fitting in at college. Three items were found significant at the .001 level: concern about transportation to and from college, fear of parents' reaction to desire to attend college, and the need to make money to help support the family financially. Four of the eight significantly different barriers related to family and culture. The other significant items measured financial and personal barriers, and a lack of knowledge of the system. The remaining 22 barriers did not reflect significant differences between Hispanics and non-Hispanics. Though not significantly different, Hispanics scored a higher mean response (indicating less of a barrier) for the statement "I can see that college will benefit me in the future."

In exploring the second hypothesis, Hispanics' mean score for agriculture perceptions was 75.089 ($SD = 9.827$) compared to a higher mean score (reflecting more positive perceptions) for non-Hispanics of 79.337 ($SD = 9.827$). A t-test found these scores to be significantly different ($t = -2.711$, $p < .05$) indicating that Hispanics held a more negative perception of agriculture than do non-Hispanics.

Separate Mann Whitney U tests were run on each of the 23 agriculture perception items in the scale. For eight of the items, there were significant differences between Hispanics and non-Hispanics. In each of these cases, non-Hispanics had a more positive perception of agriculture than did Hispanics. Seven of the items were found significant at the .05 level. These items were: "agriculture is mainly farming," "the highest you can go in agriculture is owning your own farm," "there are many careers in agriculture which require a college degree," "agriculture is mainly manual labor," "agriculturally-related jobs are low paying," "many careers in agriculture require a strong science background," and "an agricultural career is a respected career." One item was found significant at the .001 level, "agriculture requires mainly unskilled workers."

Hispanics' negative perceptions of agriculture appear to be rooted in their personal or family experiences of field work. Five of the significant items directly related to agriculture as farming, manual labor, low-paying, not respected, or unskilled work. Similarly, Hispanics did not perceive agriculture to offer a range of careers or to require a strong science background, or a college degree. The three lowest mean scores, reflecting the most negative perceptions, referred to employment in agriculture as seasonal, unsanitary, and often unsafe because of chemicals. These items reflect a narrow, limited knowledge of agriculture.

Eight acculturation factors were investigated to test the third and fourth hypotheses. These included: place of birth, parents' place of birth, grandparents' place of birth, language used in home, language literacy skills, music preference, and a self-acculturation rating. Separate Kruskal-Wallis one-way analyses of variance were computed for each acculturation factor on both barrier and perception scales. Of these eight acculturation factors, seven were found significantly linked to barriers to higher education. These included place of birth ($X = 7.16$, $df = 2$), parents' place of birth ($X = 9.31$, $df = 3$), grandparents' place of birth ($X = 12.78$, $df = 3$), preferred language ($X = 6.96$, df 2), reading and writing skills ($X = 6.29$, $df = 2$), preferred music ($X = 6.90$, $df = 1$), and a self acculturation rating ($X = 18.78$, $df = 5$). Only three of the eight acculturation factors were found significant when exploring respondents' perceptions of agriculture. These were parents' place of birth ($X = 10.24$, $df = 3$), language spoken in home ($X = 15.38$, $df = 5$), and the self acculturation rating ($X = 17.22$, $df = 5$). In each case, the more acculturated responses correlated with fewer perceived barriers to higher education, and more positive perceptions of agriculture.

Conclusions and/or Recommendations

This study found several differences between Hispanic and non-Hispanic high-school students. First, Hispanic students perceive more overall barriers to participation in higher education. They differ particularly on barriers relating to family and cultural factors, followed by financial factors. Despite these barriers, Hispanics did report an ability--even beyond that of the Non-Hispanics in the sample--to see that college would benefit them in the future. Second, Hispanics tended to have more negative perceptions of agriculture. Specifically, they were more likely to view agriculture as only farming, low-paying, manual labor, low technology, poor working conditions and limited career potential. Third, degree of acculturation does influence Hispanic high school students' perceived barriers to higher education and perceptions of agriculture. More acculturated students indicated fewer perceived barriers to higher education and more positive perceptions of agriculture.

Colleges of agriculture hoping to increase Hispanic enrollment must be aware of the barriers perceived and encountered by Hispanic students. Serving this population goes beyond simply providing financial assistance. While scholarships and financial aid are important, this study found other barriers--particularly those relating to culture and family--to be significant. Early outreach, educational partnerships, parent education, and programs which are designed to work within the context of Hispanic family structure have proven to be effective strategies. Recruitment efforts will need to take into account Hispanics' degree of acculturation, and cultural factors such as feelings of guilt about leaving the family.

Providing intensive educational experiences which take into account Hispanics' experience-based, intensified, negative agriculture impressions should help open Hispanic students' eyes to the new opportunities to be found in today's agriculture. More student and faculty role models can be powerful motivators and could make Hispanic students feel like they fit in at colleges of agriculture.

Since Hispanics make up a growing share of high school enrollments--up to 70% in some central Washington high schools--agriculture teachers should examine their efforts to attract and retain this sizable pool of students. Looking at curricula and FFA activities are places to start. Innovative programs such as an agricultural career module, at-school "home" projects, and new contests such as sales, computers and agriscience are among the possibilities. Hispanics should be well-represented on vocational advisory committees. Here, they can help design relevant courses and activities and once again, serve as role models to Hispanic youth. Agriculture teachers and counselors should work together so that agriculture courses can fit into college preparatory tracks. Those in agricultural education at all levels should work together to provide Hispanic students an educational ladder "with every rung in place." Addressing their unique barriers, level of acculturation, and intensely negative agricultural perceptions, will all be important rungs of this ladder.

The work and resilience of the Hispanic people has contributed to the productivity of American agriculture. With already considerable experience in field work and bilingual abilities, Hispanic youth can benefit the industry in ways ranging from labor relations to international marketing. Clearly, Hispanics have earned their share of the 48,000 jobs predicted for agriculture college graduates between 1990 and 1995. By helping them climb the educational ladder, colleges of agriculture can provide Hispanics new opportunities to reap some of the rewards of their peoples' contributions to agriculture. The next generation of Mexican Americans, their communities and the agricultural industry will be the beneficiaries.

References

Bowen, B. (1987). A minority's perspective on minorities in agriculture. The Agriculture Education Magazine, 60, 3-4.

Coulter, K. J.., Goecker, A., & Stanton, M. (1990, December). Employment opportunities for college graduates in food and agricultural sciences. U.S. Department of Agriculture, Cooperative State Research Service, Higher Education Programs.

Flores, B. & Kellogg, B. (1989). 26 hours at Cal-Poly: A recruitment strategy for underrepresented groups. Paper presented at the National Convention of the American Vocational Association. (ERIC Document Reproduction Service No. ED 314633).

Hickey, C. & Solis, D. (1990). Recruitment and retention of minority trainees in university affiliated programs--Hispanics. University of Wisconsin-Madison. (ERIC Document Reproduction Service No. ED 328034).

Hoover, T. & Houser, M. (1991). Pennsylvania governor's school for the agricultural sciences: Participant perceptions about agricultural careers. NACTA Journal, 35(2), 14-16.

Orthel, G., Sorenson, J., Lierman, S., & Riesenberg, L. (1989). The image of agriculture: High school students' perceptions of agriculture and careers in agriculture. A survey conducted by Agriculture and Extension Education, College of Agriculture, University of Idaho, Moscow, ID.

Rendon, L. & Amauray, N. (1988). Salvaging minority transfer students--Toward new policies that facilitate baccalaureate attainment. Cambridge, MA: Carnegie Corporation. (ERIC Document Reproduction Service No. 305098).

Romo, H. (1984). The Mexican origin population's differing perceptions of their children's schooling. Social Science Quarterly, 65(2), 635-649.

Trotter, E. (1988). Minority apprenticeship program boosting agriculture and natural resource enrollments. NACTA Journal, 32(4), 16-17.

U.S. Bureau of the Census. (1991). 1990 census profile. Race and Hispanic Origin. Washington, DC: U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census.

U.S. Department of Education. (1992). Earned degrees 1989-1990. The Department Chair, 3(2), 13, 20.

White, C., Stewart, B., & Linhardt, R. (1991). Career opportunities in agriculture as perceived by inner city high school students. Journal of Agricultural Education, 32(1), 30-34.

Wirsching, T. & Stenberg, L. (1992). Determinants of Idaho Hispanic female participation in adult vocational education programs. Journal of Vocational Education Research, 17(3) 35-57.

HISPANICS IN AGRICULTURE: BARRIERS TO EDUCATIONAL RECRUITMENT

A Critique

David E. Lawver, Texas Tech University -- Discussant

The research questions dealt with in this study included Hispanics and Non-Hispanics perceptions concerning barriers to higher education and perceptions concerning agriculture. Also investigated were differences between Hispanics and Non-Hispanics perceptions based upon the respondents' acculturation. The researchers are attempting to further explain the challenges faced by higher education in the recruitment of Hispanics into college agriculture programs. We know that Hispanics are under represented. Why are Hispanics under represented? A more important question is what can be done to make college education in agriculture more attractive to Hispanics.

The researchers have done an excellent job in developing a theoretical framework for this study. The literature supports each of the research questions from which null hypotheses were formulated. As I read through the introduction of the manuscript the first time, I felt that the researchers would be justified in formulating directional hypotheses. Perhaps page limitations on paper length prevented the listing of directional hypotheses.

The researchers utilized a purposefully selected sample for this study. This is probably justified if no attempts to generalize beyond the sample are made. However, it is mentioned that the target population consisted of Hispanic and non-Hispanic high school agriculture students in central Washington. This, and the use of inferential statistics, implies that generalizations are being made.

Reliability and validity concerns were addressed in the manuscript. Cronbach's alpha coefficients of 0.83 and 0.82 were reported and a panel of students and faculty was used to insure the validity of the instrument.

In reporting the mean total barrier score, the researchers found a statistically significant difference between Hispanics and non-Hispanics. The total non-Hispanic score was 105.604 which was only 4.11 points different than the total Hispanic score. I wonder just how important that difference is. Could there be other barriers that are not addressed? Similar concerns arose with the reported statistically significant difference found with the mean agriculture perception score.

The Acculturation Rating Scale for Mexican-Americans (ARSMA) appears to be an appropriate instrument for describing the degree to which Hispanics have been acculturated into society. More information as to how the scale is constructed (e.g. open ended, closed ended Likert, etc.) would be helpful.

The conclusions and recommendations made as a result of this study are appropriate and on target. The researchers recommend more student and faculty role models which most experts recommend as well. How can this be accomplished? The authors refer to the "intensely negative agricultural perceptions" held by Hispanics. An average difference of 0.19 on a 5-point Likert scale may be statistically significant. The difference may not be enough to be classified as intense.

This study contributes needed information concerning the recruitment of Hispanic agriculture students in college. There are indeed differences between Hispanics and non-Hispanics that need to be addressed when recruiting. This research provides a valuable beginning point as the profession continues to research and plan programs to address the problem of the under represented Hispanic population in higher education in agriculture.

FACTORS INFLUENCING MINORITY AND NON-MINORITY STUDENTS TO ENROLL IN AN INTRODUCTORY AGRISCIENCE COURSE IN TEXAS

B. Allen Talbert, Visiting Assistant Professor
Alvin Larke, Jr., Associate Professor
Department of Agricultural Education
Texas A&M University

Introduction and Theoretical Framework

The United States, including Texas, is experiencing a demographic shift that will continue into the twenty-first century. The National Council for Agricultural Education in 1989 recognized this shift in stating that one of the national goals of agricultural education is "to serve all people and groups equally and without discrimination" (p. 4). It is predicted that in Texas, current minority groups will constitute over 50% of the State's population by the year 2025 (Murdock, Hoque, & Hamm, 1989). The secondary enrollment in Texas public schools for the 1990-91 school year was 51.9% White, 13.9% Black, 31.7% Hispanic, 2.3% Asian-American, and 0.2% Native American (Texas Education Agency, 1991). However, the percentage of minorities enrolled in agriscience courses did not reflect the percentage of minorities in either the overall school age population or the secondary school population. In the 1990-91 school year, the agricultural education enrollment in secondary schools in Texas was composed of 76.5% White, 6.0% Black, 17.2% Hispanic, and less than 1% Asian-Americans, Native Americans, and others (Eudy, 1991).

The theoretical base for the study comes from the literature that details the uniqueness of minority adolescents. Ogbu (1986) argued that minorities who were incorporated into American society against their will are different from the White majority and from other minorities such as immigrants. He called these groups "castelike minorities" and gave as examples Blacks, Hispanics, and Native Americans. Boykin (1986) expanded on this theme by proposing the theory that minorities must cope within three areas. Everyone, including Whites, interacts within the "mainstream" or majority culture. Next, there is a separate minority culture that groups like Blacks, Hispanics, and Asian-Americans contribute to and experience. Finally, each minority group has its own distinct actions, reactions, and experiences that fit into the majority culture with varying degrees of success. Longstreet (1978) stated that ethnic groups are different in five aspects of style. These are verbal and nonverbal communication, orientation modes, social value patterns, and intellectual modes. Longstreet used these aspects to conduct observations of minority and non-minority students in classroom settings and found that the minority students were different.

Purpose and Objectives

The purpose of this study was to identify factors influencing minority and non-minority students to enroll in an introductory agriscience course in Texas. The objectives of the study were:

1. To describe selected demographic and situational characteristics of minority and non-minority students enrolled in an introductory agriscience course; and,

2. To compare minority and non-minority students enrolled in an introductory agriscience course in Texas on reasons for enrolling, perceived barriers to enrolling, and attitudes toward agriculture.

Methods

The population of the study consisted of approximately 19,000 students enrolled in Agriscience 101, "Introduction to World Agricultural Science and Technology," and Agriscience 102, "Applied Agricultural Science and Technology," in approximately 1,000 Texas public schools during the Fall semester, 1991. A cluster sample of individual agriscience departments was taken using the 10 supervisory areas of the state to stratify the sample. The 60 agriscience departments in the sample were selected using a formula by Fink and Kosecoff (1985) that bases the sample size on the smallest subgroup. Fifty-seven departments, with 1,399 AGSC 101 and 102 students, responded resulting in a 95 percent response rate. Appropriate mail survey techniques as detailed by Dillman (1978) were utilized. The sample was surveyed using a five-part questionnaire developed by the researcher based on similar questionnaires by Flores (1989) and Marshall (1990).

Descriptive statistics were used to address Objective One. Analysis of Variance was used to compare the students' minority status (independent variable) on scaled variables (dependent variables) to satisfy Objective Two.

Scales were developed, both conceptually and empirically, to measure students' reasons for enrolling, perceived barriers to enrolling, and personal opinions toward agriculture. The Reasons for Enrolling scales were called Agriculture, Influential Persons, Agricultural Career, Disavowance, and Good Feeling. Only the Agriculture and Disavowance scales are described and reported in this paper. The Barriers to enrolling scales were called Personal Negative, Teacher Negative, Course Negative, and Agriculture Negative. The Personal Opinions scales were called Personal Career, Agricultural Occupations, and Occupational Requirements.

The Agriculture scale, 13 items with a Cronbach's Alpha of .84, measured the influence of the agriscience course and agriculture in general on the student's decision to enroll. Most of the items in this scale related to the traditional aspects of agriculture and agricultural education, such as animals, fairs and shows, and hands-on learning. The Disavowance scale, four items with a Cronbach's Alpha of .67, measured the extent to which the student felt enrolling was out of his/her control. These items related to the influence of counselors, principals, and the placement of course offerings in the schedule.

The Personal Negative scale, five items with a Cronbach's Alpha of .75, measured the influence of negative interactions with other students on perceived barriers to enrolling. These items addressed such issues as not being like the other students in class, having negative experiences with other students, and receiving peer pressure not to enroll. The Teacher Negative scale, four items with an Cronbach's Alpha of .80, measured negative interactions with the agriscience teacher. This scale contained items such as teacher discrimination, the teacher not being like the student, and the teacher being indifferent. The Course Negative scale, five items with a Cronbach's alpha of .83, measured the degree that perceived course attributes were a barrier to enrolling. This scale included items about the FFA, course difficulty, and career preparation. The influence of the student's negative perceptions toward agriculture on perceived barriers were measured by the Agriculture Negative scale, five items with a Cronbach's Alpha of .86. These items related to the status, pay, and physical demands of agriculture.

The Personal Career scale, five items with a Cronbach's Alpha of .80, measured the student's likelihood to enter an agricultural career. The Agricultural Occupations scale, seven items with a Cronbach's Alpha of .85, measured the student's perceptions on the variety and scope of the agriculture industry. These items related to parts of agriculture besides livestock and crop production. The Occupational Requirements scale, six items with a Cronbach's Alpha of .73, measured the student's perceptions on the requirements needed to obtain a job in agriculture. This scale included items related to the level of training, basic skills, education, and expertise needed for an occupation in agriculture.

Findings

Blacks were 6.3% of the sample, while Hispanic students made up 17% (Table 1). Whites (72.5%) were a majority of the sample. Less than 1% of the sample identified themselves as Asian-American. Although less than 1% of the study population was Native American, 47 students (3.4%) in the sample identified themselves as such. There were five students who did not respond to this question.

Table 1
Ethnicity of Students in the Sample

Ethnicity									
Black		Hispanic		White		Asian-American		Native American	
n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
88	(6.3)	237	(17.0)	1011	(72.5)	11	(0.8)	47	(3.4)

A majority (93.0%) of students identified the ethnicity of their teacher as White (Table 2). Less than 2% of the students had a Black teacher, and less than 6% an Hispanic teacher. However, 5.9% of Black students in the sample had a Black teacher, while 27.8% of Hispanic students had an Hispanic teacher. Only 16 of the 1,011 White students (1.6%) had a Black or Hispanic teacher.

Table 2
Percentage of Students with Teachers of Each Ethnicity

	Teachers' Ethnicity					
Ethnicity of Student	Black		Hispanic		White	
	n	(%)	n	(%)	n	(%)
Black	5	(5.9)	2	(2.4)	78	(91.8)
Hispanic	5	(2.3)	64	(27.8)	161	(70.0)
White	8	(0.8)	8	(0.8)	991	(98.4)
Overall	18	(1.4)	74	(5.6)	1230	(93.0)

Table 3 shows that a plurality of White students (46.3%) reported that they lived on a farm or in a rural area (46.3%). The remainder of the White students reported that they lived in a small town (25.7%) or a suburban or urban area (28.0%). Black students reported they lived on a farm or in a rural area (35.6%), in a small town (35.6%), or in an urban or suburban area (28.7%). A majority of the Hispanic students lived in a small town (51.9%), 30.8% lived on a farm or in a rural area, and 17.3% reported they lived in an urban or suburban area.

Table 3
Residence of Students in the Sample

Ethnicity	Place of Residence Farm		Rural		Small Town		Suburban		Urban	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Black	12	(13.8)	19	(21.8)	31	(35.6)	19	(21.8)	6	(6.9)
Hispanic	26	(11.0)	47	(19.8)	123	(51.9)	33	(13.9)	8	(3.4)
White	195	(19.4)	271	(26.9)	259	(25.7)	216	(21.4)	66	(6.6)
Overall	245	(17.6)	349	(25.0)	432	(31.0)	284	(20.4)	84	(6.0)

Agriscience students who were also 4-H members, or had ever been members, constituted 36.5% of the sample (Table 4). By ethnicity, 39.3% of White students, 34.9% of Black students, and 22.4% of Hispanics were either present or past 4-H members.

Table 4
Membership in 4-H

Ethnicity	Current or Previous Membership Yes		No	
	n	(%)	n	(%)
Black	30	(34.9)	56	(65.1)
Hispanic	52	(22.4)	180	(77.6)
White	395	(39.3)	609	(60.7)
Overall	505	(36.5)	877	(63.5)

Table 5 shows that non-minorities were more likely than minorities to enroll in the agriscience course because of agricultural and agricultural education course reasons. On the other hand, the Disavowance scale shows that minority students more so than non-minority students enrolled in the agriscience course for reasons perceived to be out of their control.

Table 5
ANOVA of Students' Reason for Enrolling Scale Scores by Minority Status

Scale	Minority Status	Mean*	Standard Deviation	F Ratio	F Prob.
Agriculture	Yes	2.3343	.6823	85.2702	<.01
	No	2.7343	.6590		
Disavowance	Yes	1.5600	.8704	52.0622	<.01
	No	1.1681	.8465		

* 0 = strongly disagree; 1 = disagree; 2 = neutral; 3 = agree; 4 = strongly agree

The Barriers to Enrollment scales (Table 6) show an opposite effect from the Reasons for Enrolling scales. All of the Barriers scales have means below 2.0 which may lead to the conclusion that none of these constructs are barriers to enrolling. However, the range of scores for the individual scales included students' scores that approached "strongly agree." Therefore, another interpretation may be that any one barrier is enough to keep students from enrolling even though overall barriers are low. Also, one must remember that regardless of perceived barriers, all students in this study did enroll. Students who had the opportunity to enroll, but did not may tend to have higher scores for the Barriers scales. Therefore, for analysis purposes, a higher mean will be described as a perception of a greater barrier.

Minority students were more likely to perceive barriers to enrolling than non-minority students. Minority students perceived other students as being the greatest barrier to enrolling. The Teacher Negative scale yielded the lowest mean among minority students, indicating that the teacher was the least significant barrier.

Table 6
ANOVA of Students' Barriers to Enrollment Scale Scores by Minority Status

Scale	Minority Status	Mean*	Standard Deviation	F Ratio	F Prob.
Personal Negative	Yes No	1.5930 1.2198	.7898 .8768	46.0754	<.01
Teacher Negative	Yes No	1.3710 1.0356	.8434 .9415	32.1939	<.01
Course Negative	Yes No	1.5522 1.1674	.8224 .9213	44.7291	<.01
Agriculture Negative	Yes No	1.4758 1.1367	.8640 .9256	33.5023	<.01

* 0 = strongly disagree; 1 = disagree; 2 = neutral; 3 = agree; 4 = strongly agree

Table 7 shows the students' Personal Opinions by Minority Status. For all three scales, non-minority students had the more positive attitudes. Non-minority students saw more career opportunities for themselves in agriculture, more occupational diversity within agriculture, and showed more agreement that occupations in agriculture require knowledge and expertise. For all three scales, minority students approached "neutral" in their attitudes.

Table 7
ANOVA of Students' Personal Opinions Scale Scores by Minority Status

Scale	Minority Status	Mean*	Standard Deviation	F Ratio	F Prob.
Personal Career	Yes	2.3512	.7935	47.4834	<.01
	No	2.7209	.8298		
Agricultural Occupations	Yes	2.4563	.7491	55.7732	<.01
	No	2.8064	.7165		
Occupational Requirements	Yes	2.3051	.7205	56.4975	<.01
	No	2.6370	.6669		

* 0 = strongly disagree; 1 = disagree; 2 = neutral; 3 = agree; 4 = strongly agree

Conclusions

1. The ethnic composition of AGSC 101 and 102 classrooms was not proportional to that of public schools in Texas. Minority students were underrepresented in these two introductory agriscience courses. These two courses are the gateway to future enrollment in agriscience courses. Unless minority enrollment in AGSC 101 and 102 is increased, overall minority enrollment in agriscience education will continue to be small.

2. Most agriscience students had a White teacher. If, as the literature suggests, students need role models of their own ethnicity to guide them into educational programs and subsequently into occupations, then minority students will continue to perceive agricultural occupations as not desirable for them unless more minority teachers are employed.

3. Black and Hispanic students had less of a rural background than White students. They also had more negative attitudes towards the traditional parts of agriculture. To overcome these biases, the urban aspects of agriculture may be emphasized to help in recruiting minority students into agriscience education.

4. Minority agriscience students, especially Hispanic students, did not have 4-H experience to the same extent as White students. If, as other parts of this research suggest, 4-H membership is related to a positive attitude toward agriculture, involving minority youth in 4-H might lead to higher enrollments in agriscience education.

5. Minority students were less inclined to enroll in AGSC 101 and 102 courses for agricultural reasons, and more likely to feel that they were in the course because of circumstances beyond their control. They perceived more barriers to enrolling and had more negative attitudes toward agriculture and agricultural occupations. Until minority students' perceptions change and barriers to enrollment are removed, greater minority participation in agriscience education should not be expected.

Recommendations

1. Because few minority students had either 4-H experience or were from farm/rural backgrounds, they lack early, positive images of agriculture and agricultural education. Agricultural education should focus awareness and informational activities on the elementary grades and should conduct recruitment activities no later than the middle school grades.

2. The literature reveals that positive role models of the same ethnicity can be influential factors for students to enroll in agriscience course and ultimately pursue agricultural careers. Agriscience education should work to increase the number of minority teachers in public schools. On an immediate basis, agriscience teachers should utilize minority agricultural professionals in the classroom and FFA activities. In addition, minorities should be depicted in instructional materials.

3. Because minority students were more likely to enroll for disavowance reasons, educators need to discourage the practice of forcing students into agriscience courses. Efforts should be made to change possible negative perception of agriculture held by guidance counselors and others in influential roles.

4. Local agriscience teachers need minority recruitment strategies and publications available on demand. These strategies and publications should be developed based on research and should be supplied to teachers in a self-contained, ready-to-use form.

5. Once minority students have enrolled in one agriscience course, efforts need to be made to ensure their success and continued enrollment. These retention efforts should be based on research and should be supplied to agriscience teachers in a self-contained, ready-to-use form.

6. The comparisons of minority and non-minority students in this study were between students already enrolled in the agriscience course. Research should be conducted comparing minority students not enrolled in an agriscience course with those enrolled in an agriscience course.

References

Boykin, A. W. (1986). The triple quandary and the schooling of Afro-American children. In U. Neisser (Ed.), The school achievement of minority children (pp. 57-71). Hillsdale, NJ: Lawrence Erlbaum Associates.

Dillman, D. (1978). Mail and telephone surveys: The total design method. New York: Wiley.

Eudy, J. L. (1991, March 20). [Agricultural education enrollment in secondary schools]. Unpublished raw data, (Private Collection, B. Talbert).

Fink, A. & Kosecoff, J. B. (1985). How to conduct surveys: A step-by-step guide. Beverly Hills, CA: Sage.

Flores, R. A. (1989). A comparison of Hispanic and non-Hispanic students enrolled in programs of agricultural education in secondary schools in the south coast region of California. Unpublished doctoral dissertation. College Station: Texas A&M University.

Longstreet, W. S. (1978). Aspects of ethnicity. New York: Teachers College Press.

Marshall, T. E. (1990). Analysis of enrollment in agricultural science and membership in the FFA in Texas. Unpublished doctoral dissertation. College Station: Texas A&M University.

Murdock, S. H., Hoque, N. N., & Hamm, R. R. (1989). State and regional projections for Texas to 2025 of population based change in the labor force, enrollment in elementary and secondary schools, enrollment in college, households, and incidences of diseases/disorders. College Station: Texas A&M University, (Private Collection, B. Talbert).

National Council for Agricultural Education. (1989). The strategic plan for agricultural education: A national mobilization plan for revolutionary change in agricultural education. Washington, DC: National Summit on Agricultural Education.

Ogbu, J. U. (1986). The consequences of the American caste system. In U. Neisser (Ed.), The school achievement of minority children (pp. 19-56). Hillsdale, NJ: Lawrence Erlbaum Associates.

Texas Education Agency. (1991). [Students by grade, sex, and ethnicity: State totals]. Unpublished raw data, (Private Collection, B. Talbert).

FACTORS INFLUENCING MINORITY AND NON-MINORITY STUDENTS TO ENROLL IN AN INTRODUCTORY AGRISCIENCE COURSE IN TEXAS

A Critique

David E. Lawver, Texas Tech University -- Discussant

The objectives of this research were to describe selected demographic and situational characteristics of minority and non-minority students enrolled in an introductory agriscience course in Texas and to compare reasons for enrolling, perceived barriers to enrolling, and attitudes toward agriculture. This research deals with an important topic -- minority enrollment in secondary agricultural education. We must recognize the fact that agricultural education is not adequately serving all segments of society. This research is intended to help us to begin to understand the problem.

The researchers have provided an adequate literature review to build a theoretical framework for this study. The literature also shows that enrollment in Texas secondary agriscience programs is not representative of the population of the state. This discrepancy suggests that there is a need not being met by agricultural education in Texas.

This paper is well written and easy to understand. The methodology appears to have no major flaws. I would like to see the study expanded to include minority students not enrolled in agricultural education as recommended in the final recommendation. It seems that the students who were not enrolled would provide better understanding to the under-representation problem.

A stratified sample may not be necessary for this study. This study sought to describe and compare the situation in Texas, not each of the ten supervisory areas. A stratified sample would be appropriate if the researchers had reason to compare based on supervisory areas. Simple random selection should provide a representative sample.

The Cronbach's Alpha reliability coefficients for the various scales of the instrument described in this paper ranged from 0.67 to 0.86. No mention of how validity was assured was made other than the fact that a similar questionnaire was used in two other studies. As a reader of this report, I would appreciate being able to find out how the researchers handled validity concerns without having to go back to those studies.

The results of the this study provide evidence that minority students are indeed different than non-minority students in attitudes and perceptions concerning agriculture and agricultural education. This study provides a foundation for future research and program development concerning the under representation of minority students in secondary agricultural education in Texas. The researchers are to be commended for a job well done.

NAERM Second Session
8:30-10:00 a.m.
Concurrent Session B

Theme: Integrating Science and Math into Secondary Agriculture Programs

Topic 1: The influence of agriscience and natural resources curriculum on students' science achievement scores

Speakers: James Connors, Jack Elliot (The University of Arizona)

Topic 2: Mathematical problem-solving ability of secondary agriculture teachers

Speakers: Greg Miller (Iowa State University)
Joe Gliem (The Ohio State University)

Topic 3: Factors influencing resource sharing between agriculture and science teachers participating in the agriscience program

Speaker: Linda Whent (University of California-Davis)

Topic 4: Evaluation of the pilot testing of the biotechnology in agriculture curriculum in oklahoma

Speakers: Jeffrey Horne, James Key (Oklahoma State University)

Discussant: Carl Reynolds (University of Wyoming)

Chairperson: Jimmy Cheek (University of Florida)

Facilitator: Carol Conroy (The Pennsylvania State University)

THE INFLUENCE OF AGRISCIENCE AND NATURAL RESOURCES CURRICULUM ON STUDENTS' SCIENCE ACHIEVEMENT SCORES

James Connors
Adjunct Instructor
Agricultural Education
The University of Arizona

Jack Elliot
Assistant Professor
Agricultural Education
The University of Arizona

Introduction

The past decade has seen many calls for educational reform in the United States. Parents, teachers, and educational professionals have called for new and innovative approaches to teaching English, mathematics and science. According to the "Nation at Risk" Report (National Commission on Excellence in Education, 1983), "There was a steady decline in science achievement scores of U.S. students" (p. 9).

The trend in science achievement scores has not improved. Former Secretary of Education William Bennett (1988) wrote that, "A new assessment places American science students in rough international perspective" (p. 13). Ten year-olds placed 8th among 15 countries tested, 14 year-olds placed 14th out of 17 countries. These poor science test results have increased the demand for improved science education for American students. Typically, these demands have only led to more hours added to the school day or more days added to the school year. However, the American Association for the Advancement of Science (1989), in its "Project 2061 Report: Science for All Americans" stated that, "A fundamental premise of Project 2061 is that the schools do not need to be asked to teach more and more content, but rather to focus on what is essential to scientific literacy and to teach it more effectively." This indicates that a different method of teaching science to students is needed.

This research was built on the theoretical framework that ANR programs teach most of the same science objectives as other science courses and that students who complete agriscience and natural resources courses perform as well as students who receive science credit from other science classes.

Moss (1986) found that "A total of 76 instructional objectives from the Basic Program of Vocational Agriculture in Louisiana curriculum guide were identified as science related objectives." Anderson and Boddy (1985) stated that "specific secondary vocational programs that contain significant components of chemistry, biology, and physics related skills are: production agriculture, and horticulture" (p. 8).

Many educators believe that agriscience and natural resources is an excellent method for teaching science. Budke (1991) stated, "agriculture provides a marvelous vehicle for teaching genetics, photosynthesis, nutrition, pollution control, water quality, reproduction, and food processing where real live examples can become part of the classroom experimentation and observation" (p. 4).

Two research studies have shown that students taught science using agricultural and natural resources perform equally or better than students taught science using traditional instructional methods. Whent and Leising (1988) reported, "agricultural students in test schools achieved slightly higher on the biology test than did bio-science students" (p. 14). The researchers concluded that agricultural students were mastering the state science standards on an equal level with students in general science classes. Enderlin and Osborne (1991) studied science achievement of middle school science students. The researchers compared a laboratory oriented agricultural approach with a traditional science instruction approach in teaching a plant science unit of study.

Enderlin and Osborne also used a post-test only, control group design for their study. The researchers concluded, "student acquisition of science knowledge differs significantly between those students who receive agriculturally oriented laboratory instruction in science and those students who receive traditional science instruction." The agriculturally oriented students received higher scores.

This comprehensive review of literature was used to develop a conceptual framework for the study. The framework in Figure 1 shows how agriscience and natural resources fits into a complete secondary science education program.

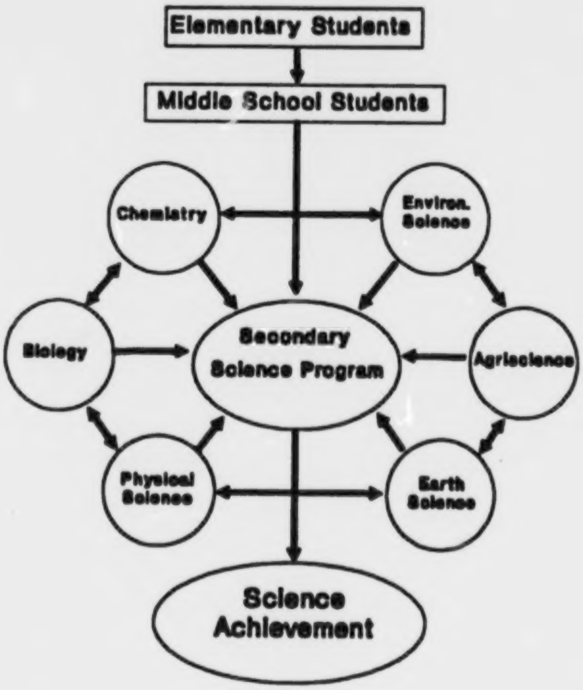

Elementary Students
Middle School Students
Chemistry
Environ. Science
Biology
Secondary Science Program
Agriscience
Physical Science
Earth Science
Science Achievement

Figure 1
Conceptual Framework

Purpose and Objectives

Agriscience and natural resources (ANR) programs utilize activity-oriented instructional methods to instruct students in science. However, many parents, educators and administrators do not feel that agriscience and natural resources classes are viable alternatives to more traditional science courses for high achieving college-bound students. Is agriscience and natural resources a legitimate science course? Do students who enroll in agriscience and natural resources classes perform as well on science tests as students who take more traditional science classes? These are a couple of questions that this research study attempted to answer.

1. Determine if there was any difference between students who had agriscience and natural resources courses and those who did not on standardized science achievement tests.

2. Determine the influence of students' demographic characteristics on their science achievement scores.

A research hypothesis was used to test the influence of science courses on students' science achievement test scores. The hypothesis stated:

H_0 No difference in biology test scores will be found between students who had agriscience and natural resources courses and students who did not have agriscience and natural resources courses.

The alternative hypothesis stated:

H_1 Students who had agriscience and natural resources courses will have mean scores that are different when compared to students who did not have agriscience and natural resources courses.

For testing purposes, the hypotheses were diagrammed as follows with μ_1 represents those students who had agriscience and natural resources classes and μ_2 representing those students who did not have agriscience and natural resources classes.

$$H_0 \quad \mu_1 = \mu_2$$

$$H_1 \quad \mu_1 \neq \mu_2$$

Procedures

This study was a pre-experimental study that used a static-group comparison design. The independent variable in this study was the number of credits students had completed in science classes, including agriscience and natural resources. Extraneous variables included gender, race, grade point average, socioeconomic status and school characteristics. The socioeconomic status of the students was determined using a family information questionnaire.

The dependent variable in this study was science achievement of high school students. A standardized science achievement test developed by a professional test development company, American Testronics, was used to measure the dependent variable. Content and face validity of the instrument was determined by American Testronics. A Kuder-Richardson reliability coefficient of .85 was reported for the test (American Testronics, 1990).

The population for this study was all seniors in four Michigan high schools that offered agriscience and natural resources classes. The four schools were selected from those schools that had completed the State Department of Education's mandatory restructuring process to offer an Agriscience and Natural Resources program. The total population consisted of 156 senior high school students. The study was limited to seniors because they had completed all science classes required for graduation and to control grade level as an extraneous variable.

Analysis of Data

The data were analyzed using the Statistical Package for the Social Sciences (SPSS/PC+) (SPSS Inc., 1991). Frequencies, means, standard deviations, t-tests, correlations and multiple regression were used to analyze the data.

Each student's socioeconomic score was calculated using a family information questionnaire and a calculation procedure that recalculated the questions into Z scores for analysis (Rossetti, Elliot et. al., 1989). Student's grade point averages and the number of science credits they had completed were obtained from official school transcripts.

A multiple regression analysis was conducted to determine if relationships existed between the independent variables and the dependent variable, science achievement test score.

Results

Seniors at participating high schools completed a family information questionnaire. The questionnaire asked the students' parents' or guardians' occupation and level of education, family income, and household possessions. Each response was coded with a specific value.

Z scores were calculated for each individual's socioeconomic status. Z scores were then categorized into quartiles for reporting purposes. Raw Z scores were used for regression analysis.

Seniors were asked four demographic questions, gender, age, race, and current grade point average. Fifty-four percent of the high school seniors were male and 46% were female. The youngest senior was 17 years old and the oldest was 19 years old. The mean age for all the seniors was slightly over 17.5 years. Over 86% of the seniors were white, 7.2% were black, 2.0% were American Indian, 1.3% were Asian, and 0.7% were Hispanic.

The seniors were asked to specify their current grade point average. In order to increase the validity of the research, the information that the seniors provided was checked with their official school records. Where discrepancies existed, the official grade point average was used for analysis. Seniors were also asked to list the different science classes they had completed and the grade they received. Grade point averages for students who had completed classes in agriscience and natural resources were calculated.

The mean grade point average for all students was 2.70 with a standard deviation of .69. The total number of science credits and agriscience and natural resources credits was determined from the questionnaires. All credits were measured using Carnegie units. The mean number of science credits completed for all respondents was 2.79. The mean number of agriscience credits completed was 1.47. Over 100 seniors (69%) never had a class in agriscience and natural resources. Forty-nine students (31.4%) did have classes in agriscience and natural resources. Table 1 displays the means, standard deviations, minimum, and maximum number of credits for the respondents.

The High School Subject Test - Biology that was used to measure science achievement consisted of 60 multiple choice questions. The mean score of all seniors who completed the test was 22.79.

Table 1
Mean Number of Science and Agriscience and Natural Resources Credits Completed by Respondents

Class	N	Mean	S.D.	Min.	Max.
Science credits	156	2.79	1.13	0.5	6.0
Agriscience and Nat. Resources	49	1.47	.79	0.5	3.5

Correlational Analysis

Correlations were performed to determine if the dependent variable, score on the science achievement test, could be correlated with students' demographic variables such as G.P.A., number of science credits, agriscience G.P.A. and credits and socioeconomic status. Because all variables were measured on the interval scale, Pearson product-moment coefficients were used for the correlations. The correlations found a substantial positive (Davis, 1971) correlation between students' grade point average and their science achievement test scores. There was a moderate correlation between students' scores and the number of science credits they had completed. Results of the correlations are shown in Table 2.

Table 2
Correlations Between Students' Science Achievement Scores and Various Demographic Variables

Variable	Coefficient	Description
Overall G.P.A.	.57	Substantial
Science credits	.49	Moderate
Agriscience and Natural Resources G.P.A.	.27	Low
Socioeconomic status	.24	Low
Agriscience and Natural Resources Credits	-.07	Negligible

Regression Analysis

A multiple regression analysis was conducted to determine which independent variables were associated significantly to the students' scores on the science achievement test. The beta value indicates the amount of change associated with the intercept for each unit of the variable being measured. The comparison group for the regression analysis was white senior high school students. Students' overall G.P.A. and the number of science credits completed were the significant variables in the regression. Table 3 contains the data from the regression analysis.

The regression analysis was used to determine if seniors who had agriscience and natural resources (ANR) classes differed from seniors who did not have ANR classes on the science achievement test. Alpha was set a prior at .05. Because H_0 was a non-directional hypothesis, a two tailed t-test was used. Two-tailed probability was .13 with a t value of -1.48. No significant differences were found between the two groups. Therefore, H_0 was tenable. The alternative hypothesis, H_1, was rejected.

Table 3
Multiple Regression of Students' Science Achievement Scores on their Independent Variables.

Independent Variables	Beta (β)	t value
Intercept	-6.26	.67
Demographic variables		
ANR students/non ANR students	-1.56	.13
Gender	-1.26	.19
Age	.74	.36
Blacks	-1.14	.56
Race (other than black or white)	2.20	.26
Overall G.P.A.	4.70	.00 *
Science credits	2.08	.00 *

* $p<.05$
$R^2 = .43$

Conclusions

This research found that high school seniors who had agriscience and natural resources classes performed as well as seniors who did not have agriscience and natural resources classes on the science achievement test. The multiple regression, while controlling for extraneous variables such as age, gender, socioeconomic status, and science credits completed by students, found no significant differences between seniors who had ANR classes and those that did not have ANR classes.

The regression also determined that high school seniors' overall grade point averages and the number of science credits they completed had a direct relationship to their scores on the science achievement test. Forty-three percent of the variance was explained.

Recommendations

As a result of the findings of this study several recommendations can be made. Local school boards should study the possibility of offering science credit for certain agriscience and natural resources classes that are shown to teach a significant amount of science objectives. State supervisors of agricultural education should also lobby for community colleges and four-year universities to recognize agriscience and natural resources as a science credit when a student applies for admission. Additional studies should be undertaken that include a larger number of schools that offer agriscience and natural resources and include a larger number of students.

References

American Association for the Advancement of Science. (1989). Project 2061: Science for All Americans. Washington DC: American Association for the Advancement of Science.

American Testronics. (1990). High-school subject tests: Teacher's manual and technical information--Form B. Chicago: American Testronics.

Anderson, B.H. & Boddy, R. (1985). The identification of science competencies included in the curriculum of secondary vocational education programs. (ERIC Document Reproduction Service No. ED 259 219)

Bennett, W.J. (1988). American Education: Making it work. Washington DC: US Government Printing Office.

Budke, W. (1991, January). Agricultural science - striving for excellence. The Agricultural Education Magazine. 63(7), pp. 4,11.

Davis, A. (1971). Elementary survey analysis. Englewood Cliffs, NJ: Prentice-Hall.

Enderlin, K. J. & Osborne, E. W. (1991, June). Achievement and retention of middle school science students in a laboratory oriented agriculture plant science unit of study. Proceedings of the Central States 45th Annual Research Conference in Agricultural Education. Springfield, IL.

Moss, J. (1986). Identification of science-related competencies taught in vocational agriculture programs in Louisiana. (ERIC Document Reproduction Services No. ED 284 010)

National Commission on Excellence in Education. (1983). A Nation At Risk: The imperative for educational reform. Washington DC: US Government Printing Office.

Rossetti, R., Elliot, J., Price, C. L. & McClay, P. S. (1989). Factors that influence a student not to enter into a high school vocational curriculum. Columbus, OH: Department of Agricultural Education, The Ohio State University.

SPSS Inc. (1991). Statistical package for the social sciences (SPSS/PC+). Chicago, Illinois.

Whent, L. S. & Leising, J. (1988). A Descriptive study of the basic core curriculum for agriculture students in California. Proceedings of the 66th Annual Western Region Agricultural Education Research Seminar. Fort Collins, Colorado.

THE INFLUENCE OF AGRISCIENCE AND NATURAL RESOURCES CURRICULUM ON STUDENTS' SCIENCE ACHIEVEMENT SCORES

A Critique

Carl L. Reynolds, University of Wyoming--Discussant

In a period of time when educational reform has such prominence in the United States, this study represents a timely response to a major problem in the profession. Agricultural educators have maintained a long time belief that our process of learning provides an excellent method for mastering a variety of disciplines.

The framework for this study is well established with the references to the problem of science achievement, the argument for agriscience instruction as an effective method for teaching science, and research studies that provided evidence of effective science instruction in agriscience. The design and procedures are well described in brief but clear fashion.

It was interesting to note that no significant differences occurred between those who had taken ANR classes and those who did not. Given the description of the population, it would be important to know whether there were any differences in the number of science classes taken by the two groups. This result and the population as described raises several questions. What impact is the agricultural and natural resources program having on science achievement? Is it being substituted as an alternative for a science required course? If so, the results speak well for the ANR program. Is it in addition to the required science courses? If so, then the results pose many other questions. To additionally compound the problem, it was noted that the correlation between agriscience and Natural Resources credits and science achievement scores were negligible.

In addition to the questions raised, it would improve the understanding of the results if more detail about the population could be described. Also, an interesting question was raised in the objectives of the study which was not addressed at all in the conclusions and recommendations. In answering the question about whether agriscience and natural resources classes represent legitimate science course offerings, it is difficult to find evidence to answer the question positively. Based upon the data presented, it is difficult to align the recommendations with the results. It would have improved the study to have included a broader discussion under implications" as opposed to the recommendations that were offered.

This study is an important contribution to the body of knowledge in the profession. It provides a basis for triggering similar studies on this important research problem. It presents a challenge that the profession should accept.

MATHEMATICAL PROBLEM-SOLVING ABILITY OF SECONDARY AGRICULTURE TEACHERS

Greg Miller
Assistant Professor
Agricultural Education and Studies
Iowa State University

Joe A. Gliem
Associate Professor
Agricultural Education and Engineering
The Ohio State University

Introduction

The National Commission on Secondary Vocational Education (1984) made two important recommendations for curriculum. First, vocational courses should provide instruction and practice in the basic skills including mathematics. Second, students should be allowed to satisfy graduation requirements for basic skills courses including mathematics with selected vocational education courses. Agricultural educators have begun to embrace the practice of including academic skills, particularly those related to science and to a lesser degree those related to mathematics, in secondary agriculture programs. And the need for research in this area has become more apparent (Buriak & Shinn, 1991; Johnson, 1991).

Dayberry (1987) and Loadman (1986) investigated the degree to which mathematics concepts and skills were being taught in vocational agriculture programs. Both Dayberry and Loadman concluded that concepts and skills in mathematics were being taught through vocational agriculture.

Vocational teachers may be teaching math concepts to their students, but are their students realizing any benefit? Anderson (1989) concluded that the number of vocational education courses completed does little to enhance the basic mathematics knowledge of students.

Miller and Gliem (1993) concluded that applied academics (Ohio's program for integrating academic concepts into vocational education) had reached few agriculture programs. They further concluded that the infusion of mathematics into the curriculum of vocational agriculture, if done at all, will likely result from teacher initiative. Is it, therefore, reasonable to expect vocational agriculture teachers to be able to apply mathematics to agriculture related problems?

A number of studies have been conducted to determine the mathematical problem-solving ability of high school and college students enrolled in agricultural mechanics courses (Gliem & Elliot, 1988; Gliem, Lichtensteiger & Hard, 1987; Gliem & Warmbrod, 1986). Findings have consistently revealed that the mathematical problem-solving ability of students is low. Only one study was identified that investigated the mathematical problem-solving ability of vocational agriculture teachers. Gliem and Persinger (1987) found that vocational agriculture teachers scored below an expected level of competence on a mathematical problem-solving test related to agricultural mechanics.

Purpose and Objectives

The purpose of this ex post facto study was to explain variance in the mathematical problem-solving ability of vocational agriculture teachers. The study was guided by the following research objectives and hypotheses.

Research Objectives

1. Describe selected background characteristics of vocational agriculture teachers.

2. Describe vocational agriculture teachers' mathematical problem-solving ability.

3. Describe relationships between vocational agriculture teachers' mathematical problem-solving ability and selected variables.

Research Hypotheses

1. There will be a significant positive relationship between the number of college-level mathematics courses completed by vocational agriculture teachers and their mathematical problem-solving ability.

2. There will be a significant positive relationship between vocational agriculture teachers' ACT math score and their mathematical problem-solving ability.

Procedures

In order to test the research hypotheses, Campbell and Stanley's (1963) design three, the static group comparison, was utilized. The selection threat was controlled by identifying extraneous variables and accounting for them utilizing the procedure described by Warmbrod and Miller (1974). The following extraneous variables were controlled: age, years of teaching experience, highest level of mathematics coursework completed, final college GPA, and attitude toward including mathematics concepts in the curriculum and instruction of secondary agriculture programs. Three extraneous variables were held constant. All subjects used calculators, were male, and were allowed one hour to complete the questionnaire.

The population consisted of all production agriculture teachers in Ohio (N=281). The Ohio Directory of Agricultural Education was used to develop a list of all production agriculture programs (N=255). Teachers from each program were invited to attend one of four sprayer calibration workshops held in different locations around the state. Questionnaires were administered during the workshops and background data were obtained from state teacher certification files and college of agriculture records. Teachers from 34 programs participated in the study for a 13.3% program participation rate and a 9% teacher participation rate.

Teachers who participated in the study were compared to representative samples of non-participants to determine if participants were similar to the population on background characteristics. Comparisons were made on the following characteristics; age, years of teaching experience, number of college mathematics courses completed, highest level of college mathematics coursework completed, ACT math score, and final college GPA. Only one significant difference was found. Participants had significantly higher final college GPA's than non-participants. Participants were similar to the population on background characteristics, however, caution should be exercised in generalizing the results beyond the teachers studied.

Agriculture teachers' mathematical problem-solving ability was measured by a test consisting of 15 open-ended mathematical word problems scored dichotomously (right or wrong). The test was developed from a review of literature on agriculture related mathematical word problems, and from contributions of experts in various departments in the College of Agriculture. Content and face validity were assessed by a panel of experts consisting of teacher educators in agriculture and mathematics. The problem-solving instrument was pilot tested with a group of 20 undergraduates enrolled in a Methods of Teaching Agriculture course. Cronbach's Alpha for the mathematical problem-solving test was .85.

The attitudinal instrument was composed of 15 Likert-type items with response categories ranging from strongly disagree (1) to strongly agree (5). Content and face validity were assessed by a panel of experts consisting of faculty and graduate students in the Department of Agricultural

Education. The instrument was field tested with a group of 18 secondary agriculture teachers not included in the sample. Cronbach's Alpha was used to assess the reliability of the instrument and yielded a coefficient of .87.

Analysis of Data

The data were analyzed using the SPSS/PC+ statistical package. The alpha level was set *a priori* at .05, and Davis' (1971) descriptors were used to interpret all correlation coefficients.

Results

All of the teachers participating in the study were male. Participants had a mean age of 38.24 years with a standard deviation of 8.86, and on average, had 12.71 years of teaching experience with a standard deviation of 7.55. Additionally, teachers had completed an average of 2.47 college mathematics courses, possessed a mean ACT math score of 24.27, and had an average final college GPA of 2.77. In regards to highest level of college mathematics coursework completed, 10% (3) completed basic math courses, 53.3% (16) completed intermediate math courses, and 36.7% (11) completed advance mathematics courses (Table 3).

Agriculture teachers' scores on the 15-item mathematical problem-solving test ranged from a low of 4 (26.67%) to a high of 15 (100%). The distribution of scores on the mathematical problem-solving test was negatively skewed with a mean of 9.97 (66.47%) and a standard deviation of 2.96 (Table 1).

Pearson correlations and multiple regression were utilized to describe the relationships between vocational agriculture teachers' mathematical problem-solving ability and selected variables. The relationships between teachers' problem-solving ability and age and years of teaching experience were low and positive. The relationship between teachers' problem-solving ability and highest level of college mathematics coursework completed, final college grade point average, and attitude toward including mathematics concepts in the curriculum and instruction of secondary agriculture programs were positive and moderate. The relationships between teachers' mathematical problem-solving ability and the following variables were statistically significant: years of teaching experience, final college grade point average, and attitude toward including mathematics concepts in the curriculum and instruction of secondary agriculture programs (Table 3).

Table 1
Agriculture Teachers' Score on the Fifteen-Item Mathematical Problem-Solving Test

Score	Frequency	Percent	Cum. %
4-6	4	11.8	11.8
7-9	12	35.3	47.1
10-12	11	32.3	79.4
13-15	7	20.6	100.0
Total	34	100.0	

Mean = 9.97 Std. Dev. = 2.96

Tests of Hypotheses

In order to test the research hypotheses, the procedure described by Warmbrod and Miller (1974) was used. According to Warmbrod and Miller, extraneous variables significantly related to both the dependent variable and the major independent variables pose a serious threat to the internal validity of the major hypotheses. None of the extraneous variables were significantly related to the major independent variables (Table 2).

Table 2
Summary of Relationships Between Major Independent Variables and Extraneous Variables

Extraneous Variables	No. of Math Courses	ACT Math
Age	-.12	.26
Years of Teaching Experience	-.02	.23
Highest Level of Math	.29[a]	.05[a]
Final College GPA	-.25	.04
Attitude	-.01	.17

[a] Multiple R

The research hypothesis that the relationship between teachers' mathematical problem-solving ability and the number of college level mathematics courses completed would be significant and positive was rejected ($r = -.21$, $p > .05$) (Table 3). The research hypothesis that the relationship between teachers' mathematical problem-solving ability and ACT math score would be significant and positive was accepted ($r = .67$, $p < .05$) (Table 3).

Table 3
Summary of Relationships Between Major Independent Variables, Extraneous Variables, and Mathematical Problem-Solving Ability

Variable	n	Mean	S.D.	Degree of Association
Major IV				
No. of Math Courses	30	2.47	1.33	-.21
ACT Math Score	11	24.27	3.95	.67*
Extraneous Variables				
Age	34	38.24	8.86	.19
Years of Teaching Experience	34	12.71	7.55	.29*
Final College GPA	30	2.77	.39	.38*
Attitude[a]	34	4.47	.35	.35*
Highest level of Math	30	--	--	.38[b]
Basic		3		
Intermediate	16			
Advanced		11		

* $p < .05$

[a] Based on scale: (1) strongly disagree, (2) disagree, (3) undecided, (4) agree, (5) strongly agree.

[b] Multiple R

Discussion of Findings

The relationship between the number of college level mathematics courses completed and agriculture teachers' mathematical problem-solving ability was negative and non-significant. This finding supports those of Hague and Phua (1990), Gliem and Elliot (1988), and Gliem, Lichtensteiger, and Hard (1987). On the other hand, several researchers (Gliem & Persinger, 1987; Gliem & Warmbrod, 1986; Van Blerkom, 1986) report positive relationships between mathematical problem-solving ability and the number of mathematics courses completed.

How students are taught mathematics in general and problem-solving specifically may have a greater influence on their mathematical problem-solving ability (Gliem & Elliot, 1988; Gliem, Lichtensteiger, & Hard 1987; Polya, 1987; The Commission on Teaching Standards for School Mathematics, 1991).

Gliem and Warmbrod (1986) suggested that one strategy for improving the competence of prospective teachers in mathematical problem-solving would be to incorporate mathematical problem-solving as an integral part of agricultural engineering and agricultural mechanics courses that prospective teachers complete. Subsequent research by Gliem and Persinger (1987) revealed that teachers completing a course that utilized the "unit factor method" of solving problems scored significantly higher on a mathematical problem-solving test than teachers who did not complete such a course. Furthermore, Gliem, Lichtensteiger, and Hard (1987) concluded that students completing an applied mechanics course designed to increase students' problem-solving skills exhibited significantly greater competence in mathematical problem-solving ability after completing the course and retained their increased competence for at least six months.

The finding that ACT math score and mathematical problem-solving ability were significantly related supported findings of Gliem and Elliot (1988) and Gliem, Lichtensteiger, and Hard (1987). The association between ACT math score and mathematical problem-solving ability was positive and substantial in all three investigations.

Conclusions

Based upon the findings of the study the following conclusions were drawn.

1. Agriculture teachers participating in the study tended to take more mathematics courses than was required for the bachelor's degree in agricultural education. Also, more than one third of the agriculture teachers took advanced mathematics courses in addition to or instead of basic or intermediate mathematics courses.

2. The highest level of mathematics coursework needed to correctly solve all of the problems included in the test was algebra. Agriculture teachers, on average, correctly solved 9.97 (66.47%) of the fifteen mathematical word problems. Agriculture teachers attained lower scores than would be expected of persons teaching secondary students how to solve agricultural related mathematics problems. It was concluded that the agriculture teachers studied were not proficient in solving agriculture related mathematics problems.

3. Although the magnitude of the relationship was low, teachers completing fewer mathematics courses tended to attain higher scores on the mathematical problem-solving test.

4. Teachers with higher ACT math scores tended to achieve higher scores on the mathematical problem-solving test.

Recommendations

Although the participants were not a probability sample of all production agriculture teachers in Ohio, the results support those of several other research studies. Based upon this study and other related research the following recommendations were made.

1. Findings of the current investigation suggest that more and higher levels of mathematics coursework are not positively related to teachers' mathematical problem-solving ability. How students are taught may be as important as how much they are taught. Therefore, it is recommended that mathematical problem-solving be incorporated into technical agriculture courses taken by undergraduates in agricultural education.

2. Teacher educators and state supervisors of agricultural education in Ohio should jointly plan inservice education activities to improve the mathematical problem-solving ability of secondary agriculture teachers. Inservice activities in mathematical problem-solving could be specifically targeted at applying mathematics to agricultural related problems or incorporated into workshops designed to address specific technical agriculture competencies.

3. Research has shown that secondary agriculture students lack competence in solving agricultural related mathematics problems. In order for agriculture students to become better mathematical problem-solvers, teachers must become better mathematical problem-solvers. Simply improving teachers' ability to apply mathematics to agricultural related problems will not fully address the issue, however. Therefore, it is recommended that high quality instructional materials involving the application of mathematics to agriculture be developed cooperatively by teacher educators in mathematics and agriculture as well as secondary agriculture and mathematics teachers. Inservice education should be provided to agriculture teachers regarding ways to utilize these instructional materials in their agriculture programs.

4. Two indicators of academic ability (ACT math score, and final college grade point average) were significantly related to agriculture teachers' score on the mathematical problem-solving test. In light of current efforts to upgrade the academic content of secondary agriculture programs, persons with high scores on measures of academic ability should be recruited to fill future openings for secondary agriculture teaching positions.

References

Anderson , K. W. (1989). An analysis of factors contributing to changes in mathematics skills of secondary students. (Doctoral dissertation, Colorado State University, 1989). Dissertation Abstracts International, 51/02A, 488.

Buriak, P. & Shinn, G. C. (1991). A structure for a research agenda for agricultural education: A national Delphi involving internal experts. Proceedings of the 18th Annual National Agricultural Education Research Meeting, Los Angeles, CA.

Campbell, D. T. & Stanley, J. C. (1963). Experimental and quasi-experimental designs for research. Chicago: Rand McNally.

Davis, J. A. (1971). Elementary survey analysis. Englewood Cliffs, NJ: Prentice-Hall.

Dayberry, D. T. (1991). Mathematics and science provided through vocational agriculture in Texas (Doctoral Dissertation, Texas A&M University, 1987). Dissertation Abstracts International, 48/12a, 3035.

Gliem, J. A. & Elliot, J. (1988). Problem-solving skills of agricultural education undergraduates when completing mathematical word problems in agricultural mechanics. Proceedings of the 15th Annual National Agricultural Education Research Meeting. St. Louis, MO.

Gliem, J. A., Lichtensteiger, M. J., & Hard, D. L. (1987). Mathematical problem-solving skills in agricultural mechanics of undergraduate students in agriculture. Proceedings of the 14th Annual National Agricultural Education Research Meeting. Las Vegas, NV.

Gliem, J. A. & Persinger, K. M. (1987). Mathematical problem-solving skills of high school vocational agriculture students and teachers. Proceedings of the 14th Annual National Agricultural Education Research Meeting. Las Vegas, NV.

Gliem, J. A. & Warmbrod, J. R. (1986). Students problem-solving abilities in agricultural mechanics. Paper No. 86-5057, American Society of Agricultural Engineers. St. Joseph, Michigan.

Hague, S. K. & Phua, M. S. (1990). Reactions to word problems: Perceptions and performance. Washington: University of the District of Columbia.

Johnson, D. M. (1991). Student achievement and factors related to achievement in a state agricultural mechanics contest. The Journal of Agricultural Education, 32(3), 23-28.

Loadman, W. E. (1986). Comparison study of vocational and traditional students on mathematics and science achievement. Columbus: The Ohio State University, College of Education.

Miller, G. & Gliem, J. A. (1993). Integration of mathematics into the agriculture curriculum: Are teachers ready? Proceedings of the 47th Annual Research Conference in Agricultural Education. St. Louis, MO.

Polya, G. (1987). On learning, teaching, and learning teaching. In F. R. Curcio (Ed.), Teaching and learning a problem-solving approach (pp. 1-15). Reston, VA: The National Council of Teachers of Mathematics.

The Commission on Teaching Standards for School Mathematics. (1991). Professional standards for teaching mathematics. Reston, VA: National Council of Teachers of Mathematics.

National Commission on Secondary Vocational Education. (1984). The unfinished agenda (Information Series No. 289). Columbus, OH: The National Center for Research in Vocational Education.

Van Blerkom, M. L. (1986). Mathematical ability in college students: A causal analysis. Paper Presented at the Annual Convention of the American Psychological Association. Los Angeles, CA.

Warmbrod, J. R. & Miller, J. E. (1974). Ex post facto (correlational) research: A case study. Paper prepared for AVA presession on Fundamentals of Research Design and Statistical Analysis, New Orleans, LA.

MATHEMATICAL PROBLEM-SOLVING ABILITY OF SECONDARY AGRICULTURE TEACHERS

A Critique

Carl L. Reynolds, University of Wyoming -- Discussant

This research study is a timely one that addresses one of the key challenges educators have been asked to address, improve the academic instruction in the vocational education curriculum. The theoretical framework is comprehensive and is developed with a depth that is highly commendable. The documentation presented in this paper places it in high reputation within the profession.

The purpose and procedures are well matched to achieve the goals of the study. The procedures were carefully designed to address any threats to the validity of the results. I commend the researchers for incorporating a valuable research study with an essential in-service activity that is well linked together. This approach is a lesson from which the junior members of our profession especially could benefit.

The results and especially the discussion of the findings were presented in such a way that the interpretations of the conclusions and the recommendations were most clear and meaningful. The references to the results from numerous other studies were especially helpful in the interpretation.

It is interesting that higher education mathematics instruction did not contribute to the mathematics problem-solving abilities of agriculture teachers. The recommendation that how students are taught mathematics is an important message for the profession that requires a response. I fully endorse the recommendation that our profession respond and incorporate mathematics problem-solving skills in technical agriculture courses for undergraduates in agricultural education. I think that we would find this recommendation has a strong educational psychology basis as well.

I commend the authors of this paper for a well designed and well conducted study that deserves to be shared beyond our profession.

FACTORS INFLUENCING RESOURCE SHARING BETWEEN AGRICULTURE AND SCIENCE TEACHERS PARTICIPATING IN THE AGRISCIENCE PROGRAM

Linda Whent
Supervisor of Teacher Education
University of California, Davis

Introduction

As American agriculture becomes more scientific and technological, more science knowledge and skills are demanded of its workforce. Neville Clarke, Director of the Texas Agricultural Experiment Station stated, "Today, agriculture needs a new infusion of science and technology and new capabilities that will restore and enhance the competitiveness of U.S. agriculture in the work market place" (Clarke, 1986, p. 37). Roegge and Russell (1988) conducted a study to determine how well agriculture and biology can be integrated in a high school setting. They found that the integrated approach was superior to the traditional approach in producing higher overall achievement. Alley (1984) reported that experts agreed that the "process" of education should assert that teaching be a facilitating process; they also endorsed less lecture and increased opportunities to integrate academic theory and real life learning.

Understanding Agriculture (1988, p. 62) stated, "As students progress through school, instruction should continue to illuminate the links between science, society, and practical problems". . . "and [w]hether vocational agriculture will flourish under the new [educational] requirements will depend at least in part on its own capacity to be flexible and scientifically rigorous."

The California High School Task Force stated in Second to None: A Vision of the New California High School (1992, p. 7), "If we have learned anything about educational reform during the decade of the 1980's, it has been that single initiatives cannot simply operate in isolation." They recommended that students "choose an organized program around a special focus that combines academic, applied academic, and field experiences" (p. 21).

Dormody (1991) conducted a national study to explore the resource sharing between secondary school agricultural education teachers and science departments. He found that 60% of the teachers surveyed had shared some resources(s) with the science department during the 1989 -90 academic year. Fifty-eight percent had shared equipment and supplies, while only 24% had provided instructional services. A significantly higher percentage of agriculture teachers shared facilities with a science department than utilized science department facilities.

It is not uncommon for agriculture teachers to spend many years teaching in the same school and yet have little or no idea what the biology teachers are doing in their classrooms. With current educational trends mandating a move toward integration in education, consideration should be given to the barriers in teaching that promote isolation between subject areas; research should then be done to determine which procedures/alterations may be effective in breaking down those barriers.

The AgriScience Institute and Outreach Program was designed to bridge the gap between agriculture and science education (Whent, 1991, 1992). The AgriScience Program tested a model to integrate agriculture and science education in a variety of high schools across the United States. The program model focused on integrating agriculture and science education in two phases. The first phase involved forming ten collaborative science and agriculture teaching teams to develop and test AgriScience laboratory exercises. The agriculture and science teacher teams attended a two-week AgriScience Institute and working in collaboration with university researchers they developed AgriScience instructional laboratories. The second phase of the program comprised a two-day train-the-trainer meeting; the trained teachers then conducted six or more workshops in their region of the United States. In spring, summer and fall of 1992, a total of 63 Outreach Workshops were conducted in the continental United States and in Alaska.

Purpose and Objectives

The purpose of this study was to explore resource sharing between agriculture and science teachers who participated in the AgriScience Institute and Outreach Program. Specific objectives were to:

1. Determine if participation in the program increased the sharing of resources between science and agriculture teacher participants.
2. Determine if differences existed between sharing of resources and facilities between agriculture and science teachers.
3. Determine if differences existed between resource sharing between Phase I and Phase II of the program.
4. Identify specific resources commonly shared by agriculture and science teachers participating in the program.
5. Identify barriers inhibiting the cooperation and resource sharing between agriculture and science teachers.

Procedures

Ten agriculture/science teacher teams were selected for the study through a national search effort. During the winter of 1991, letters were sent to state agriculture supervisors and department heads in the field of agriculture teacher education throughout the United States. (These state supervisors and teacher educators were asked to nominate agriculture and science teacher teams from their state to participate in this program.) Specific selection criteria included the following:

1. Teacher teams had to consist of an agriculture teacher and a biological science teacher from the same school district.
2. Teachers had to make a two-year commitment to the program.
3. Teachers had to agree to become a continuing resource for other teachers in their region.
4. Teachers had to submit evidence of: (a) teaching excellence, (b) leadership within their teaching field, (c) a high level of communication skill, and (d) affiliations with professional associations and local resource networks.
5. Teachers had to provide evidence of their school administrators' support.

Two hundred fifty nominations were received and all were sent application forms. Completed applications were received from 84 teams. A selection committee of four, comprised of agriculture and science teachers and agriculture teacher educators selected ten teams for this program.

The research methodology used a panel longitudinal research design methodology. Questionnaires were administered three times between July 1991 and December 1992. Two questionnaires were used, both modified forms of the questionnaire developed by Dormody (1991). One questionnaire collected data from science teachers and the other collected data from agriculture teachers. The questionnaires contained two Likert-type scales, each containing five resource-sharing indicators representing the resource categories of 1) instructional services (e.g., team teaching, quest lecturer and teaching as part of a panel); 2) equipment and supplies (e.g., glassware, microscopes and shop equipment); 3) instructional materials (e.g., textbooks, lesson plans and films); 4) program support services (e.g., advise students, member of advisory committee and physical work; and 5) facilities (e.g., land lab, biology lab, and greenhouse) (Dormody, 1991). The first scale on the agriculture teacher questionnaire measured use of science department resources while the second scale measured resources shared with the science department. The first scale on the science teacher questionnaire measured use of agriculture department resources and the second scale measured science resources shared with the agriculture department. Responses were recorded using the following four point Likert scale:

Response Levels

not at all	once/twice	a few times	many times
1	2	3	4

Both questionnaires contained a check-list of shared resources for each of the five resource categories. The agriculture teacher questionnaire contained a check-list that identified resources provided by the science department, and the science teacher questionnaire contained a check-list identifying resources provided by the agriculture department. Each check-list provided an additional category wherein teachers could identify shared resources that had not been included on the questionnaire. Cronbach's Alpha reliability coefficients for the two scales measuring sharing of departmental resources and use of other departmental resources were .81 and .88, respectively (Dormody, 1991).

Participants were mailed questionnaires as a pre-measure prior to coming to the two-week AgriScience Institute at the University of Wisconsin, Madison in July 1991. Participants were mailed a second questionnaire in February 1992 after completing the field testing of the instructional materials (Phase I). The third questionnaire was mailed in December 1992 to participants after completion of the Outreach Workshops (Phase II). During the three mailings, non respondents received personal phone calls asking them to return their survey. Nine our of the original ten teams completed the study. Descriptive statistics were calculated using the Statview program for statistical analysis.

Results

The mean age of the agriculture teachers was 37.6, ranging from 28 through 55; and the mean age of science teachers was 41, ranging from 31 through 59 years of age. Science teachers had a mean of 15 years of teaching, ranging from 5 to 24 years. Agriculture teachers had a mean of 12 years of teaching, ranging from 3 to 33 years.

The science teachers comprised 7 white males, 1 black female, and 1 Filipino female; the agriculture teachers included 7 white males and 2 white females. All but two teacher teams taught in the same school. Five teams taught in rural schools, three teams taught in suburban schools, and one team taught in an urban school. All but one of the agriculture teachers in this study were from one-teacher agriculture departments. The mean number of science teachers per science department was 5.4, ranging from 1 to 14.

The mean rating of the level of resources used by agriculture and science teachers are presented in Table 1. Table 2 presents the resources shared with another department (agriculture or science). Both tables present mean ratings calculated from data collected during the three measurement periods (pre-measure, mid-measure and post-measure) of resource sharing for both agriculture and science teachers. Combined means on both tables reflect the means of both agriculture and science teachers. The mean totals in both tables indicate an increasing trend in both use of and sharing of resources between the science and agriculture teacher from pre-measure through post-measure. There appeared to be little difference between agriculture and science teachers with regard to use of resources (see Table 2). However, agriculture teachers reported slightly higher mean scores on the pre-measure, mid-measure and post-measure regarding the sharing of materials with the science department. This dichotomy may be explained by single agriculture teachers sharing resources with several science teachers in a school.

Table 1
Resources Used from Another Department (Agriculture or Science)

Category of Resource	Pre-measure July 1991						Mid-measure February 92						Post-measure December 92					
	Ag Teachers		Science Teachers		Combined		Ag Teachers		Science Teachers		Combined		Ag Teachers		Science Teachers		Combined	
	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD
	N = 9		N = 9		N = 18		N = 9		N = 9		N = 18		N = 9		N = 9		N = 18	
Instructional services	1.50	.71	1.17	.41	**1.38**	**.62**	1.67	1.12	1.75	1.17	**1.71**	**1.12**	2.12	.99	1.56	.88	**1.82**	**.95**
Equipment and supplies	2.90	1.20	2.17	1.17	**2.63**	**1.20**	3.56	.73	3.14	1.70	**3.36**	**.89**	3.50	.54	3.33	.86	**3.41**	**.71**
Instructional materials	2.00	.82	1.43	.79	**1.77**	**.83**	2.78	.97	2.50	.93	**2.65**	**.93**	2.75	1.04	2.67	1.00	**2.71**	**.99**
Program support services	2.20	1.39	2.00	1.07	**2.11**	**1.23**	2.78	1.30	3.00	.76	**2.88**	**1.05**	3.13	.84	3.33	.71	**3.24**	**.75**
Facilities	1.40	.97	1.88	.99	**1.61**	**.98**	1.78	1.30	2.50	1.41	**2.12**	**1.36**	2.10	1.25	2.67	1.12	**2.41**	**1.18**
Mean Totals	**2.00**		**1.73**		**1.90**		**2.51**		**2.58**		**2.54**		**2.72**		**2.71**		**2.72**	

Table 2
Resources Shared with Another Department (Agriculture or Science)

Category of Resource	Pre-measure July 1991						Mid-measure February 92						Post-measure December 92					
	Ag Teachers		Science Teachers		Combined		Ag Teachers		Science Teachers		Combined		Ag Teachers		Science Teachers		Combined	
	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD	X	SD
	N = 9		N = 9		N = 18		N = 9		N = 9		N = 18		N = 9		N = 9		N = 18	
Instructional services	1.50	1.08	1.00	.00	**1.28**	**.83**	1.36	1.06	1.13	.35	**1.25**	**.78**	2.25	1.28	1.56	.88	**1.88**	**1.11**
Equipment and supplies	2.67	1.00	2.13	.99	**2.41**	**1.00**	3.00	.76	3.00	.93	**3.00**	**.82**	3.25	.46	3.11	.93	**3.18**	**.73**
Instructional materials	2.10	.88	1.67	1.03	**1.88**	**.93**	2.63	.74	2.38	.92	**2.50**	**.82**	3.00	.54	2.33	1.00	**2.65**	**.86**
Program support services	2.00	1.05	2.12	.99	**2.06**	**.98**	3.11	.60	2.63	1.06	**2.88**	**.86**	2.88	.84	2.89	.78	**2.89**	**.78**
Facilities	2.20	1.03	1.63	.92	**1.94**	**.98**	2.25	1.17	2.25	1.39	**2.25**	**1.24**	3.00	.93	2.25	1.04	**2.64**	**1.03**
Mean Totals	**2.09**		**1.71**		**1.91**		**2.47**		**2.28**		**2.38**		**2.88**		**2.42**		**2.65**	

Mean differences were calculated to determine changes from pre-measure, mid-measure and post-measure between science and agriculture teachers in their sharing of resources. A positive difference reflected an increased use of resources from pre-measure to mid-measure during Phase I of the program, and from mid-measure to post-measure during Phase II of the program. Negative differences reflect a decreased use of resources from one measure to the next. Table 3 presents the mean changes of resources used from another department (agriculture or science) during Phases I and II of the program. Table 4 presents the means changes of resources shared with another department (agriculture or science) during Phases I and II of the program. The science teachers reported a greater change in both their use of agriculture resources and their sharing of science resources during Phase I of the program. These results may be explained by the lower pre-measure means of the science teachers in both tables. The agriculture teachers reported a greater change in both resources sharing with the science department and resources used from the science department during Phase II of the program. Since Phase II was the inservice phase of the program, it may be speculated that the agriculture teachers were more involved with the growing and supplying of plants and other agricultural materials for the science teachers in preparation for the Outreach Workshops.

Table 3
Changes in the Mean Resources Used from Another Department (Science or Agriculture) During Phase I and Phase II of the AgriScience Institute and Outreach Program

	Phase I			Phase II		
	Ag	Sci	Combined	Ag	Sci.	Combined
Category of Resource	N = 9		N = 18	N = 9		N = 18
Instructional services	.17	.58	.33	.45	-.19	.11
Equipment and supplies	.66	.97	.73	-.06	.19	.05
Instructional materials	.78	1.07	.88	-.03	.17	.06
Program support services	.58	1.00	.77	.35	.33	.36
Facilities.	.38	.62	.51	.32	.17	.29
Total Change	2.57	4.24	3.22	1.03	.67	.87

Table 4
Changes in the Mean Resources Shared With Another Department (Science or Agriculture) During Phase I and Phase II of the AgriScience Institute and Outreach Program

	Phase I			Phase II		
	Ag	Sci	Combined	Ag	Sci.	Combined
Category of Resource	N = 9		N = 18	N = 9		N = 18
instructional services	-.14	.13	-.03	.89	.43	.63
equipment and supplies	.33	.87	.59	.25	.11	.18
instructional materials	.53	.71.	.62	.37	-.05	.15
program support services	1.11	.51	.82	-.23	.26	.01
facilities.	.05	.62	.31	.75	.00	.39
Total Change	1.88	2.84	2.30	2.24	.75	1.36

Specific resources commonly shared by agriculture and science teachers in the program are presented in Table 5. Responses on the check-list portions of the questionnaires were summarized from the three measurement intervals. In general, more agriculture teachers checked resources received from the science department than science teachers checked resources received from the agriculture department. The instructional services most often shared with other teachers were team teaching and/or teaching the other teacher's class. The most common supplies and equipment provided to science teachers by the agriculture department were growing plant materials. Both groups reported similar levels of sharing program support services. The most commonly reported facility provided by the science department was the use of a biology lab, and the facility most commonly provided by the agricultural department was the agricultural mechanics lab.

Table 5
Other Department Resources Most Commonly Received by Teachers

Category	Ag Teacher Times Received from Science	Category	Science Teacher Times Received from Ag
Instructional services received		Instructional services received	
team taught	7	team taught	2
taught by themselves	4	taught by themselves	3
Equipment and supplies used		Equipment and supplies used	
chemicals/glasses	18	chemicals/glasses	7
glassware/plasticware	19	soil, plants, nitrogen test kits	17
microscopes	14	biological specimens	7
balance	10		
Instructional materials used		Instructional materials used	
catalogs	20	catalogs	5
lesson/unit plans	7	periodical	6
textbooks	19	textbooks	6
Program support services		Program support services	
informal program advice	17	informal program advice	15
physical work	14	advised students into sci	11
		physical work	8
Facilities		Facilities	
biology lab	11	agriculture mechanics lab	9
		greenhouse	3

Data on barriers to cooperation were collected through open-ended questions. Teachers were asked to list specific barriers to sharing of resources encountered during the program. Four major barriers to sharing of resources were indicated: 1) an initial lack of understanding of what the other teacher teaches and the resources available, 2) the physical distance between the agriculture department and the science department, 3) difficulty in finding time to work together due to preparation periods being scheduled at different times, and 4) a general lack of administrative support for integration.

Teachers were asked if participation in the AgriScience Institute and Outreach Program had increased sharing of resources between departments. All 18 teachers in the study responded that resources sharing had increased. They were then asked to respond to an open-ended question asking which phase(s) of the program most contributed to this increase. Eleven teachers indicated that traveling together, planning, preparing, and presenting the Outreach workshops (Phase II) contributed to increased sharing of resources. Five teachers responded that sharing of resources increased due to the personal friendships that developed during the entire program experience (Phases I and II).

Conclusions and Recommendations

The population for this study consisted of teachers selected through a rigorous process, in which teaching skill, instructional material development experience, and leadership efforts were considered. Teacher teams ranged from barely knowing one another to experiencing a strong relationship before the study. Generalizations and inferences from this population to other populations cannot be made. However, some research findings from this study may have logical implications for other populations.

The following conclusions were drawn regarding the cooperation and resource sharing of teachers participating in the AgriScience Institute and Outreach Program.

1. Participation in the program did increase the cooperation and resource sharing between agriculture and science teacher participants.
2. Through information sharing, team building, and assigned tasks, it is possible to increase the amount of cooperation and resource sharing of both the agriculture and science teachers to similar levels.
3. Due to initially low pre-measure means, science teachers had the greatest gains in cooperation and sharing of resources during the team building, instructional materials development, and testing phase of the program (Phase I).
4. A major factor inhibiting the science teachers from utilizing agriculture department resources was a lack of awareness of both the resources available and similarities in curriculum.
5. Agriculture teachers had higher gains in cooperation and sharing of resources during the workshop phase of the program (Phase II).
6. School administrative policies that are supportive of integration of academic areas; house the agriculture and science facilities in close proximity, and that schedule the same preparation periods for agriculture and science teachers may remove barriers to agriculture and science teacher resource sharing.

Based on the conclusions of this study the following recommendations can be made:

1. Information about science and agriculture departmental resources, facilities and curriculum is needed to increase awareness of and resource sharing between agriculture and science teachers.
2. Barriers due to lack of administrative support may inhibit departmental sharing of resources. Thus, it is recommended that future models of this program or similar programs include an administrator in the model as part of the teacher team.
3. Programs seeking to increase resource sharing and integration should schedule common preparation periods for cooperating teachers.
4. Teaching materials, in-service sessions, and pre-service programs should address the need to increase teacher awareness of other departmental resources and toward sharing of resources and facilities with other disciplines.

Recommendations for Further Research

1. Further study is needed to explore secondary school culture, biases, and practices that inhibit sharing of resources and integration between subject areas.

2. More research needs to be done to determine the effects of science/agriculture department cooperation on student learning.

References

Agee, J. L. (1992). Second to None: A Vision of the New California High School. Bureau of Publications, California Department of Education, Sacramento, CA.

Alley, J. D. (1984). Selected futures and general education: A Delphi study (curriculum, instruction). Ed.D. Dissertation, Memphis State University, Dissertation Abstracts International, 45(10-A), 3076.

Clarke, N. P. (1986). Implication of the biotechnology revolution for agriculture. In John J. Cowley (Ed.), Research for Tomorrow, Yearbook of Agriculture (pp. 37-41). Washington, DC: U.S.D.A.

Committee on Agricultural Education in Secondary Schools, Board on Agriculture, National Research Council. (1988). Understanding agriculture: New directions for education. Washington DC: National Academy Press.

Dormody, T. J. (1991). Resource Sharing Between Secondary School Teachers of Agriculture and Science Departments: A National Study. In Proceedings of the Tenth Annual Western Regional Agricultural Education Research Meeting, Seattle, Washington.

Roegge, C. A. & Russell, E. B. (1988). Integrating biological principles with secondary agricultural instruction. In Proceeding of the Central States 42nd Annual Research Conference in Agricultural Education (pp. 209-221), Chicago, Illinois.

Whent, L. S. (1992). Bridging the Gap Between Agricultural and Science Education. Agricultural Education Magazine, (65)4, pp 6 - 8.

FACTORS INFLUENCING RESEARCH SHARING BETWEEN AGRICULTURE AND SCIENCE TEACHERS PARTICIPATING IN THE AGRISCIENCE PROGRAM

A Critique

Carl L. Reynolds, University of Wyoming--Discussant

It is commendable that a researcher responded to a need triggered by the research report of a colleague in implementing and completing this study. In current times of eduction reform when we are asked to do better with fewer resources, this work by Whent following the efforts of Dormody is a valuable contribution to the profession.

It was most appropriate that this resource sharing research was applied to a program with the national scope and impact that the Agriscience Institute and Outreach Program has had. The design, population, and procedures were appropriate for the objectives as stated in the report. The amount of space devoted to addressing the history of the program was an essential and appropriate part that enhanced the understanding of the results. The longitudinal approach was especially helpful in interpreting the results.

Based upon the nature and focus of the respective science and agriculture programs, the results were logical (science teachers share science laboratory equipment, agriculture teachers share agricultural mechanics labs and greenhouse related materials, and soil, fertilizer, and plant test kits).

The questions related to this report can easily be focused around the issue of improving resource sharing. The population in this study were select teams. How do we promote resource sharing among science and agriculture teachers in our respective states? What essential components are necessary to insure that resource sharing will be improved among all of our agricultural education departments and science teachers?

This study was well designed, well conducted, and the conclusions and recommendations are worth heeding by our profession. I commend this researcher for sharing with the profession an outstanding research report worthy of merit.

EVALUATION OF THE PILOT TESTING OF THE BIOTECHNOLOGY IN AGRICULTURE CURRICULUM IN OKLAHOMA

Jeffrey W. Horne
Assistant Professor
Agricultural Education
Southern Arkansas University

James P. Key
Professor
Agricultural Education
Oklahoma State University

Introduction

The National Research Council (1988) recommended improvements in agriculture education by applying concepts from physical, chemical, and biological sciences to teaching agriculture. The 1988 Council report recommended an updated curriculum, more scientific content, and relating the content to the increasingly scientific and technical nature of agriculture. Recent Carl Perkins legislation provides funds to integrate academic and vocational education.

Biotechnology is one area that readily integrates science and agriculture. The National Research Council (1987) defined biotechnology as

> methods of using plants, animals, and microbes, either wholly or in part, to produce useful substances or improve existing species. More specifically, biotechnology is the use of technologies based on living systems to develop commercial processes and products (p. 3)

A course entitled Biotechnology in Agriculture, which utilized curriculum of the same name developed by the Mid-America Vocational Curriculum Consortium (MAVCC) was piloted in six Oklahoma high school Agricultural Education programs during the 1991-92 school year and six schools during the 1992-93 school year. This study was an attempt to evaluate the overall effectiveness of the Biotechnology in Agriculture pilot program.
Data form one school each year was unusable.

Because Biotechnology in Agriculture is a new course, little is known about its overall effectiveness. It was deemed important by the ODVTE's Division of Agricultural Education in conjunction with the Agricultural Education Department of Oklahoma State University to evaluate the pilot testing of the Biotechnology in Agriculture curriculum.

Purpose

The primary purpose of this study was to evaluate the Biotechnology in Agriculture curriculum as piloted in high school Agricultural Education programs in the state of Oklahoma.

Objectives

The objectives of this study were to:

1. Measure competencies gained by high school students enrolled in Biotechnology in Agriculture.

2. Assess changes in attitudes toward science of students enrolled in the course.

3. Assess the attitudes of participating Agricultural Education instructors, administrators, and students toward biotechnology and this approach to teaching biotechnology.

4. Evaluate the attitudes of participating Agricultural Education instructors toward the MAVCC Biotechnology in Agriculture curriculum.

Procedures

Data gathered during the 1991-92 school year were analyzed from five classes enrolled in the Biotechnology in Agriculture course in five schools, five Agricultural Education teachers who taught the course, and principals and superintendents at each site. The number of students who participated in both the pre-test and post-test was 57. Data were gathered from five teachers and eight administrators.

Data gathered during the 1992-93 school year were analyzed from six classes enrolled in the Biotechnology in Agriculture course in five schools, six Agricultural Education teachers who taught the course, and principals and superintendents at each site. The number of students who participated in both the pre-test and post-test was 47. The addition of another instrument in the second year of the study created some time constraints; the testing took two hours instead of one, and teachers were unable to get all students excused from other courses. Therefore, there were 47 scores for the Biology Examination, 45 scores for the Biotechnology in Agriculture Test, and 43 scores for the Scientific Attitude Inventory. Three teacher questionnaires were completed and returned and five administrator questionnaires were completed and returned.

Design of the Study

The design of the study was pre-experimental. It was pre-experimental rather than true experimental in that there was a pre-test/post-test, but no control group (Campbell & Stanley, 1963). The researchers agreed with Leedy (1993) in that true-experimental research is more statistically sound; however, the lack of a comparable group alleviated the possibility of a control group. In addition to the pre-experimental portion of the study, data gathered from student group interviews and from administrator and teacher questionnaires were largely qualitative in nature.

Instrumentation

A total of six instruments were utilized the first year of this study: The Biotechnology in Agriculture test, an inventory of scientific attitudes, a student information sheet, a teacher survey, an administrator survey, and a student group questionnaire. In the second year, the Biotechnology in Agriculture Test was revised. Also, a seventh instrument, the 1990 version of the National Association of Biology Teachers/National Science Teachers Association (NABT/NSTA) High School Biology Examination, was added the second year.

The Biotechnology in Agriculture test was designed by the researcher as a pre-test/post-test. The test was reviewed by Dr. Tom Rehberger, a biotechnology expert at Oklahoma State University to determine content validity. The author used the Split-Halves method which incorporated the Spearman-Brown prophesy formula to estimate reliability. Reliability was estimated at 0.73. In the second year, reliability was estimated at 0.94 on the revised test.

The inventory of scientific attitudes, also used as a pre-test/post-test, was constructed by Richard Moore and Frank Sutman in 1970 and was tested extensively for validity and reliability (Moore & Sutman, 1970). The authors used the test-retest method to estimate a reliability of 0.934.

The teacher survey, the administrator survey, and the student group questionnaire were investigator developed and reviewed by research experts in the Oklahoma State University Agricultural Education Department.

Measurement Procedures

In the first year of the study the pre-tests were administered to the students by the investigator in November. Students also filled out information sheets at that time. The post-tests were administered to the students in May. The teacher and administrator surveys were administered at the same time. If time and schedules permitted, the teacher and administrator surveys were administered in the form of an interview; this procedure was not possible at all sites. Following the post-test a focus group interview was conducted to gather students' perceptions of the course.

The second year of the study was similar to the first, except that the pre-tests were administered in August. Another difference was that the NABT/NSTA Biology exam was administered. The addition of this test required more time for the pre-test and post-tests. During the pre-test procedure the Biology exam was administered by the investigators, since it is a copyrighted instrument. Other instruments were administered as time permitted, but most of the other pre-tests were left for teachers to administer.

Findings

A Biotechnology in Agriculture test was given as a pre- and post-test to determine student competency gains. Below are summarized results from both years of the study.

Competencies Gained in Biotechnology in Agriculture

In the 1991-1992 school year, the group of 57 students had a mean pre-test score of 32.33 with a standard deviation of 8.22. The mean post-test score was 34.18 with a standard deviation of 9.63. A t-test value of 2.233 was computed and was found to be significant at alpha .05 (p=.03).

In the second year of the study, the group of 45 students averaged 29.64 on the pre-test with a standard deviation of 8.26. The mean post-test score was 34.07 with a standard deviation of 10.42. With a t-value of 4.82, the increase was significant at alpha .05 (p=0.00).

Attitudes Toward Science

The scientific attitude inventory was given as a pre- and post-test to determine changes in scientific attitudes. No significant change was seen in attitude scores for either year in the test results. However, teachers and administrators reported that they did indeed observe changes in attitudes among the students.

Competencies in Biology

The NABT/NSTA Biology Exam was given in the second year of the study to measure competency gains in Biology. The pre-test mean was 36.09 with a standard deviation of 11.85. The mean post-test score was 38.26 with a standard deviation of 12.64. A t-value of 2.593 was computed which was significant at alpha .05 (p=0.013).

Student Perceptions

A focus group interview was conducted to determine student perceptions of the course. In the first year of the study, 42 (77.78%) of the 54 perceived the course to be a mixture of Science and Agriculture. Four (7.41%) thought it was more like Science, and eight (14.81%) thought it was more like Agriculture. In the second year, 34 (68.00%) out of 50 thought the course was more applicable to a mixture of the both, whereas 16 (32.00%) saw it as more related to Science. None said it was more related to Agriculture.

Students were asked what they liked about the course. They all reported that they enjoyed the hands-on, practical approach to the course. They liked the labs and activities, field trips, and resource people. The students enjoyed discussing current events and ethics topics related to Biotechnology. Many said they enjoyed learning about genetics and conducting the DNA extraction lab.

When asked what they disliked about the course, most students responded that they did not enjoy the lecture portion of the class. They said that some labs were too long, and some labs did not work at all. They complained about not having necessary lab equipment.

Students compared the course to other science courses they had taken by using the terms "more hands-on" and "application." They reported that the course was more interesting and less routine.

Students compared the course to other Agriculture courses by saying it was hard and more in-depth. It was thought-provoking and dealt with aspects of agriculture other than production.

When asked what changes they would make in the course, students said they would like to see more labs and activities. Labs should produce results sooner, or at least shorter labs should be integrated with the more lengthy ones. Again, students mentioned not having necessary equipment. Most agreed that the class size should be kept small, and that other teachers should become involved in the course.

Teacher Perceptions

Of the eight respondents, six (75.00%) perceived the course to be a mixture of Science and Agriculture. Two (25.00%) felt the course was more related to Science, and none thought it related more to Agriculture.

Six (75.00%) of the teachers strongly felt that the course changed their students' attitudes toward science. Comments indicated that students were excited about research and the opportunity to actually do the experiments, enabling them to better understand and relate the applications to agriculture. The other two teachers thought their students' attitudes had changed "some" and "somewhat."

Seven (87.50%) of the teachers reported that their students had positive attitudes toward the course. The eighth teacher said he thought the students perceived the course as needing more distinct direction.

Seven (87.50%) of the teachers reported positive attitudes among parents regarding the course, whereas one said he had not received any comments from parents.

All teachers that responded perceived that their principals had a positive attitude toward the Biotechnology in Agriculture course. Six (75.00%) thought their superintendents had a positive outlook toward the course. One said the superintendent was not familiar with the course and one did not comment.

All eight teachers agreed that students should be given science credit for the course. When asked what prerequisites should be required for the course, five teachers listed Biology I. One listed Basic Science and another listed Chemistry I. One teacher, who did not list specific courses, said students should have a B or better grade point average. In addition, three listed Ag I as a prerequisite.

Teachers had mixed feelings about the MAVCC curriculum. Although five (62.5%) reported that they liked the curriculum, one of these said that more supplemental material should be available. Of the three who did not specifically say they liked the curriculum, one said it needed to be less science oriented. Another said it needed a lot of polish and more basic background material in the biological and chemical science field. Another indicated it needed better lab problems and more worksheets. This teacher also said it needed some theory problems to help students understand the units better before going to the lab.

Teachers also had mixed feelings about a graduate course aimed at teaching Biotechnology. Three (37.50%) would like to see one; one said it should cover basic Biotechnology and detailed genetic engineering. Another teacher indicated that a graduate course would be a more appropriate place to teach Biotechnology, unless high school labs were better equipped. Of the remaining five, consensus seemed to be for a short workshop on the subject.

Advice from the teachers to others who might teach the course centered around preparation. The teachers agreed that the subject matter was in-depth and required much extra time on their part to be prepared to teach it. Another concern was acquisition of laboratory equipment. Several teachers had problems getting equipment, and recommended that it be ordered early in the summer for the upcoming academic year. Teachers said that class size should be limited; one suggested no more than twelve students.

Administrator Perceptions

Seven (53.84%) of the 13 administrators who responded perceived the course to be more applicable to a mixture of both Science and Agriculture. Three (23.08%) saw it as more closely related to agriculture, and three (23.08%) thought it was more applicable to Science.

Twelve (92.31%) listed Biology I as a needed prerequisite prerequisite for the course. The other listed Physical Science. Algebra I and Ag I were listed by three administrators, and one listed Chemistry I and Biology II. In addition, four said that students should be junior and seniors.

Eleven (84.62%) agreed that students should receive science credit for the course and that it should be counted as lab science credit for college entrance, whereas two administrators said science credit should not be given for the course nor should it count as lab science credit.

In regard to student perceptions of the course, nine (69.23%) of the administrators reported positive attitudes. Of the remaining four, one said a few students enjoyed it and another said it was not what the students expected.

Responses to the question of how the course enhanced education in the schools centered around the addition of another science alternative. One responded, "It made students aware of present-day technological advances in agriculture and also made them more aware of the amount of science the agriculturalists need in order to succeed in agricultural pursuits today."

When asked how they would improve the course, several administrators commented on problems getting supplies. One believed that labs should be shortened in order that results could be seen sooner, and one said that there should be better teacher inservice and possibly a principal inservice.

Conclusions

It was concluded that:

1. The statistically significant positive differences between the pre- and post-test scores on the Biotechnology in Agriculture Test for both the 1991-92 and the 1992-93 school years indicated that students make knowledge gains in Biotechnology in Agriculture.

2. No significant positive differences between the pre- and post-test scores on the Scientific Attitude Inventory for either the 1991-92 or the 1992-93 school year indicated that students exhibited no significant changes in attitudes toward science. There could be several reasons for no attitude change: the curriculum as taught did not change students' attitudes, or students' attitudes were different at different times of the school year, or the measuring instrument did not adequately measure attitudes. Based upon comments of teachers and administrators the researcher concluded the cause may be a combination of the latter two.

3. Based upon comments by students, teachers, and administrators in general, students had a positive outlook toward the Biotechnology in Agriculture course.

4. In general, students perceived the course to be applicable to both science and agriculture and that they particularly enjoyed the hands-on, practical approach to the course.

5. In general, teachers perceived the course to be applicable to both science and agriculture.

6. In general, teachers perceived a positive attitude toward the course among students, administrators, and parents.

7. Teachers agreed that science credit should be given for the course.

8. In general, teachers believed that Biology I should be a prerequisite for the course.

9. Teachers planning to teach the course need professional development in the area of agricultural biotechnology. Their preference would be for workshops rather than graduate-level university course work.

10. Teachers felt that a great amount of preparation was needed to teach the course and that they had problems with acquisition of needed equipment.

11. In general, administrators perceived the course to be more applicable to a mixture of science and agriculture.

12. In general administrators believed that Biology I should be a prerequisite for the course.

13. In general, administrators believed that students should be given science credit for the course and that it should be counted as a lab science for college entrance.

14. In general, administrators believed students had a positive attitude toward the course.

15. In general, administrators believed the course enhanced education in their schools by providing another science alternative.

16. Some laboratories in the curriculum did not produce anticipated results, at least in the settings in which they were conducted and need revision.

Recommendations

The following list of recommendations is provided to assist the users of this document in making decisions regarding the teaching of Biotechnology in Agriculture in the future. It is recommended:

1. Because of significant changes in pre- and post-Biotechnology in Agriculture test scores, and because of positive attitudes of students, teachers, and administrators toward the course, that the course be continued and the adoption of the course by interested school systems be encouraged and that formal evaluation of the program be continued.

2. That the practical focus of the course be maintained and that effort be made to include more labs and activities that will produce quicker results.

3. That Agricultural Education facilities in which the course is taught be upgraded to be more conducive to scientific experimentation.

4. That better methods of measuring scientific attitudes be sought, namely more timely instruments that focus on the practical nature of science.

5. Lab-science credit for college entrance be assigned to the course.

6. Biology I be listed as a prerequisite for the course.

7. That short in-service courses be offered to and required by all teachers interested in teaching the Biotechnology in Agriculture course.

References

Campbell, D. T. & Stanley, J. C. (1963). Experimental and quasi-experimental designs for research in teaching. In Gage, N.L. (Ed.) Handbook of research on teaching. Chicago: Rand McNally (pp. 171-246).

Leedy, P. D. (1993). Practical research: Planning and design (p. 298). MacMillan: New York.

Martin, M. A. & Baumgardt, B. R. (1991). The origins of biotechnology and its potential for agriculture. Agricultural biotechnology: Issues and choices. West Lafayette, IN: Purdue Research Foundation.

Mid-America Curriculum Consortium, Inc. (1992). Biotechnology in agriculture. Stillwater, OK: Oklahoma Department of Vocational and Technical Education.

Moore, R. W. & Sutman, F. X. (1970). The development, field test and validation of the inventory of scientific attitudes. Journal of Research in Science Teaching, 7, 85-94.

National Research Council (1987). Agricultural biotechnology: Strategies for national competitiveness. Committee on a National Strategy for Biotechnology in Agriculture. Washington, DC: National Academy Press.

National Research Council (1988). Understanding agriculture: New directions for education. Committee on Agricultural Education in Secondary Schools. Washington, DC: National Academy Press.

EVALUATION OF THE PILOT TESTING OF THE BIOTECHNOLOGY IN AGRICULTURE CURRICULUM IN OKLAHOMA

A Critique

Carl L. Reynolds, University of Wyoming -- Discussant

Evaluation of new curriculum introduced in agricultural education programs is an important research agenda item for the profession to address. This study is an excellent example of response to a new curriculum evaluation need.

The framework for the study, including the design and procedures, is well established. Respect is due to the researchers for their efforts and tenacity in completing a study involving the seven data collecting instruments and the longitudinal challenges that were presented.

The gains achieved from agricultural biotechnology competencies pre-test post-test score comparisons is impressive. This result suggests that the curriculum had a positive impact on student's competency development. In addition, the gains reported as measured by the NABT/NSTA Biology Exam was noteworthy also and speaks well for the curriculum implementation.

Also impressive in the study was the use of focus group interviews to determine perceptions of the biotechnology course that was implemented. The results contributed considerably in the evaluation process.

Based upon the nature of this study, I appreciated as well the detail with which the conclusions were formulated. I fully support the recommendations as having a sound basis from the results of the study as reported. The researchers are completing a complex study that makes a valuable contribution to the profession in the area of curriculum evaluation.

NAERM Second Session
8:30-10:00 a.m.
Concurrent Session C

Theme: Learning Styles of Students in Agricultural Education Programs

Topic 1: Agricultural distance education: A valid alternative for higher education?

Speakers: Greg Miller, Mark Honeyman (Iowa State University)

Topic 2: The relationship between levels of cognition of instruction and learning style of horticulture teachers

Speakers: Jamie Cano, Susan Metzger (The Ohio State University)

Topic 3: Cognitive learning style preferences of the Minnesota farm business management educators

Speakers: Richard Joerger (University of Wisconsin-Madison)
Edgar Persons (University of Minnesota)

Topic 4: The relationship between students' ability to demonstrate the problem solving approach to teaching in a methods class and their learning styles

Speakers: Matt Raven, Van Shelhamer (Montana State University)

Discussant: Blannie Bowen (The Pennsylvania State University)

Chairperson: David Howell (University of New Hampshire)

Facilitator: Edward Osborne (University of Illinois)

AGRICULTURAL DISTANCE EDUCATION: A VALID ALTERNATIVE FOR HIGHER EDUCATION?

Greg Miller, Assistant Professor
Mark Honeyman, Assistant Professor
Department of Agricultural Education & Studies
Iowa State University

Introduction

In 1979, an off-campus Master of Agriculture degree was approved and offered through the Professional Agriculture Curriculum at Iowa State University. An off-campus Bachelor of Science degree was approved and offered in 1991. The primary objective of the off-campus degree programs is to make quality post-secondary agricultural education available to individuals who are unable or prefer not to study on campus.

Videotaped courses have been offered through the professional agriculture curriculum since the middle 1980's. Videotapes are mailed directly to students. On-campus sessions, usually held on Saturdays, are scheduled in conjunction with the videotaped lectures for laboratory activities, group discussion, and testing. Normally, one six-hour, on-campus session is held for every semester credit awarded. Also, students may access the instructor by a toll-free telephone number.

Videotaped courses have become the primary delivery system for the Iowa State University College of Agriculture distance education programs because of their low cost and convenience to students. According to Mark Honeyman, Coordinator of Off-Campus Programs for the College of Agriculture, the use of videotaped instruction is expected to increase.

The Iowa State University College of Agriculture off-campus degree programs meet the four essential elements of a distance education program proposed by Keegan (Wilson, 1991). Keegan's elements included: (1) the separation of teacher and student during most of the instructional process, (2) the influence of an educational organization and the provision of student evaluation, (3) the use of educational media to carry course content, and (4) the provision for two-way communication.

What is known about the characteristics of distance learners? Wilson (1991) summarized literature that described distance learners as being older (20-40 years of age), professional, and more often female. Wilson noted that adults choose distance education to avoid work and leisure conflicts, to minimize travel, and for various social, economic, and geographical reasons. Lehtola and Boyd (1992) described distance learners in an agricultural safety videotaped course as self motivated and self disciplined. Gulliver and Wright (1989) found that distance learners do not place a high value on communicating with other students.

Gulliver and Wright (1989) identified three factors (access, receptivity, and desirability) that were central to understanding a student's orientation toward technology-mediated learning options. They reported that students were receptive of videotape and listed a number of desirability indicators including: flexibility, self-pacing, costs, reduced need to travel, ability to review materials, and course content that may not be readily available elsewhere.

Distance education has a number of advantages, according to Clark and Verduin (1989). It enables new audiences to enter higher education and has the potential to produce a significant number of graduates. High quality learning material is possible. Cost-benefit analyses favor distance education because participants can continue to contribute to the economy. And, the degrees of distance learners are gaining acceptance.

Newcomb (1990) observed that distance education was developing rapidly as a tool for meeting unmet educational needs. Newcomb went on to say that "as distance education rapidly evolves, a whole host of research questions are emerging. Agricultural educators need to lead the research efforts which will be required in this area" (p. 6).

Currently, a need exists to determine the characteristics of students enrolled in agricultural distance education programs, their motivations for enrolling, and their attitudes toward the program. Research of this type will aid agricultural educators in designing and conducting distance education programs in a manner consistent with the needs of students.

Purpose and Objectives

The purpose of this descriptive study was to develop a profile of students who enroll in videotaped credit courses offered by the Iowa State University College of Agriculture. The study further sought to determine student attitudes toward videotaped instruction. The objectives of the study were to:

1. Describe demographic characteristics of students enrolled in the Iowa State University College of Agriculture off-campus videotaped courses during Fall Semester, 1992.

2. Describe attitudes of students toward the use of videotape as a tool for delivering agricultural courses.

Procedures

The population for the study consisted only of active students who enrolled in off-campus videotaped courses offered by the College of Agriculture at Iowa State University (N=200). Any student who enrolled in at least one videotaped course during 1992 was considered active. The accessible population consisted of students enrolled in two distinct videotaped courses for the fall semester of 1992. Seventy-eight students were enrolled during fall semester, and all were included in the sample.

The instruments utilized in the study were developed by the researchers. Content and face validity for the questionnaire were established by a panel of faculty in the Iowa State University Agricultural Education and Studies Department. The attitudinal instrument consisted of 13 Likert-type items with five response categories, ranging from strongly disagree (1) to strongly agree (5). Cronbach's alpha was used to assess the internal consistency of the attitudinal instrument. The resulting Cronbach's alpha was .83.

Data for the study were collected by mailed questionnaire. The questionnaire, along with a cover letter and a stamped return envelope, was sent to all (n = 78) students enrolled in an off-campus videotaped course during the Fall Semester of 1992. Approximately 3 weeks after the initial package was mailed, telephone calls were made to all nonrespondents, encouraging them to complete the questionnaire and return it in the envelope provided. Approximately 1 week after the first follow-up, a second telephone follow-up of nonrespondents was completed. After each follow-up, additional questionnaires were sent to all students who had lost or discarded the original questionnaire. Sixty-one students completed and returned the questionnaire, for a response rate of 78%. Since students participating in the study were not a probability sample of active students who enrolled in off-campus videotaped courses, results will not be generalized to the population.

Analysis of Data

Data were analyzed with the SPSS/PC+ personal computer program. Appropriate statistics for description were used, including frequencies, percents, means, and standard deviations.

Results

Of the students completing the questionnaire, 86.9% (53) were male. Approximately 62% (37) of the students were enrolled for graduate credit. The remaining students were enrolled for undergraduate credit. The respondents had completed an average of 3.85 videotaped courses, with a standard deviation of 3.52.

Students enrolled in videotaped courses ranged from 21 to 58 years of age. A majority (51.6%) of the students were between 31 and 40 years of age (Table 1). The fewest number (5%) of students were 51 years of age or older. The average age of respondents was 35.68 years, with a standard deviation of 7.83.

Table 1
Student Age

Age	f	%	cum. %
21-30	16	26.7	26.7
31-40	31	51.6	78.3
41-50	10	16.7	95.0
51-60	3	5.0	100.0
Total	60	100.0	100.0

Mean = 35.68 Std. Dev. = 7.83

The most frequently cited primary occupation of the students was farming (42.6%), followed by agribusiness (19.7%), soil conservation (8.2%), agriculture extension (6.6%), and agricultural education (4.9%) (Table 2). Sixteen percent of the students were employed in other occupations such as certified public accounting, departments of natural resources, farm insurance underwriter, museum manager, machinist, and special education teacher (Table 2).

Table 2
Primary Occupation of Students

Occupation	f	%
Farming	26	42.6
Agribusiness	12	19.7
Soil Conservation Service	5	8.2
Agriculture Extension	4	6.6
Agricultural Education	3	4.9
Other	10	16.4
Unemployed	1	1.6
Total	61	100.0

Students were asked to indicate their highest level of educational attainment. The majority (63.6%) of students held a bachelor's degree. Additionally, 6.6% (4) of the students had a master's degree. Of the remaining students, 13.1% (8) had an associate's degree, and 14.8% (9) had a high school diploma (Table 3).

Table 3
Highest Level of Educational Attainment

Level	f	%	cum. %
High School Diploma	9	14.8	14.8
Associate's Degree	8	13.1	27.9
Bachelor's Degree	40	65.6	93.5
Master's Degree	4	6.6	100.0
Total	61	100.0	100.0

Students were asked what motivated them to enroll in a videotaped course. Specifically, students were asked to rank the following motives: personal development, career advancement, and pursuing a degree. Students ranked pursuing a degree highest, followed by personal development and career advancement (Table 4).

Table 4
Mean Rankings and Standard Deviations for Factors Motivating Students to Enroll in Videotaped Courses

Item	Mean	Std. Dev.
Pursuing a degree	1.82	.93
Personal development	1.90	.90
Career advancement	2.53	.87

Student attitudes toward the use of videotape as a tool for delivering agricultural courses were measured with a five-point, Likert-type scale. On average, 21% (13) of the students had attitude scores ranging from 4.51 to 5.00 (strongly agree). An additional 64% (39) provided scores ranging from 3.51 to 4.50 (agree). Approximately 13% (8) of the students provided mean attitude scores ranging from 2.51 to 3.50 (undecided), and only one (1.6%) student had a mean attitude score less than 2.50 (disagree) (Table 5).

Table 5
Mean Scores for Student Attitudes Toward Videotaped Instruction

Mean	f	%	cum. %
2.01-2.50	1	1.6	1.6
2.51-3.00	2	3.3	4.9
3.01-3.50	6	9.9	14.8
3.51-4.00	17	27.8	42.6
4.01-4.50	22	36.1	78.7
4.51-5.00	13	21.3	100.0
Total	61	100.0	100.0

Mean 4.06 Std. Dev. .54
Note: Based on scale: 1=strongly disagree; 2=disagree; 3=undecided; 4=agree; 5=strongly agree.

To facilitate greater understanding of student attitudes toward videotaped instruction, means and standard deviations for individual items are presented in Table 6. On average, students provided mean scores greater than 4.50 for items related to convenience, opportunity for learning, and whether they would enroll in additional videotaped courses. Students provided mean scores less than 3.50 and were more variable in their response to items related to feelings of isolation, and to preference of videotape over traditional classroom instruction.

Table 6
Means and Standard Deviations for Individual Items on the Attitude Scale

Item		Mean	Std. Dev.
1.	Learning through videotaped instruction is convenient.	4.69	.50
2.	Videotape provides me with learning opportunities that I otherwise would not have.	4.69	.59
3.	I would enroll in another videotaped course.	4.56	.59
4.	Videotape allows me to control the pace of my learning.	4.48	.87
5.	I would recommend videotaped courses to my friends.	4.39	.71
6.	Videotape should be utilized more often to deliver agriculture-related instruction.	4.31	.65
7.	I enjoy learning from the videotaped lessons.	4.23	.62
8.	It is more economical for persons to take classes that utilize videotape.	3.90	1.22
9.	Videotaped courses are mostly talking heads.	3.80*	1.09
10.	Learning through videotape is boring.	3.62*	1.16
11.	I would not take videotaped courses if I had some other means of acquiring course credit.	3.48*	1.12
12.	I feel more isolated as a student when I take courses by videotape.	3.36*	1.32
13.	I prefer videotape to traditional classroom instruction.	3.25	1.18

* Indicates negatively worded items that were reverse coded.
Note: Based on scale: 1=strongly disagree; 2=disagree; 3=undecided; 4=agree; 5=strongly agree.

The researchers sought to gain additional insights into the off-campus videotape program from the students' perspective. Therefore, students were asked to write any comments they had regarding the program on the last page of the questionnaire. Approximately 66% (40) of the students wrote comments. The following statements are a sample of those made by students:

> I am able to apply these courses to my farming practices.
>
> I like it. It is underwear convenient. I can watch the videos in my underwear. Try going to an on-campus class in your underwear.
>
> The staff and the instructors have always been friendly and helpful, and I feel this is very important.
>
> Without the off-campus program it would have been very hard for me to receive a degree and to still support my family.
>
> I have been pleased with the off-campus program. It has given me an opportunity to better myself and also receive college credit. When I call to ask questions the staff and instructors are courteous and helpful.

I am so happy that these programs are being offered as I have no other way at this time to further my education. Please keep offering these programs. To all those instructors that don't feel this is a valid way to earn a degree - WRONG. I have worked harder and learned more from the three video classes than from several on-campus classes. This is the way of the future.

I feel that there are two areas that could greatly improve the video courses. The first area would be to bring the level of the videos up to current technology. The other area that I feel needs to be addressed is to know your audience. The students taking these courses are older and want a more practical approach to the course content.

I would encourage instructors to utilize a number of methods in order to test the students abilities! Presenting multitudes of concepts and covering mega pages of material and then choosing 50 questions to determine the students' ability is not a fair assessment.

To me this whole program has turned my whole life around. It has opened doors that never would have been able to be opened. Please keep this program alive for others. I can never thank you enough for making a dream come true.

An introductory class on how to study with videotape would have proven useful. An instruction type seminar for lecturers in how to best utilize this media format to communicate subject material to be learned may be helpful for students and instructors.

Conclusions

1. Most of the off-campus students enrolled in videotaped courses during the fall semester of 1992 were male and were, on average, 36 years of age. The students were predominantly farmers or agricultural professionals, who brought a high degree of educational attainment to the program. The age and background of the students is indicative of a considerable amount of life and educational experiences related to agriculture.

2. Students were motivated to enroll in videotaped courses primarily to pursue master's and bachelor's degrees, but they were also motivated by a need for personal development.

3. Videotaped courses offered through the off-campus program are meeting educational needs of students throughout Iowa and surrounding states. Students indicate that videotape provides a valid means of delivering agriculture credit courses, and at least one student considered it to be the way of the future.

4. Most students held positive to strongly positive attitudes toward the use of videotape as a tool for delivering agriculture courses. The factors contributing most to the positive student attitudes were consistent with the desirability indicators identified by Gulliver and Wright (1989) and included convenience, opportunities for learning, and the ability to control the pace of learning.

Recommendations

1. Demographic data for students enrolled in videotaped courses offered through the College of Agriculture should be periodically collected and shared with instructors. If instructors know the characteristics of the clientele being served, they will be better prepared to design and conduct distance education programs in a manner consistent with the educational needs of the clientele being served.

2. Agricultural education faculty should provide training for instructors in the off-campus program at Iowa State University. This training should be designed to assist off-campus instructors in becoming facilitators of the educational process and in planning and conducting programs with students, not merely for students.

3. Results of this study should be disseminated to College of Agriculture administrators. Administrators should be aware of the diversity of clientele being served by the program, as well as the receptivity of students to videotaped instruction.

4. Further research regarding the characteristics of students enrolled in videotaped agriculture courses should examine student learning styles. Clark and Verduin (1989) found, for example, that field-dependent learners were more likely to drop out of distance education programs. Are the off-campus videotaped courses offered by the College of Agriculture at Iowa State University taken primarily by field-independent learners? Knowledge of student learning styles would have implications for the teaching methods used by off-campus instructors.

5. Additional research is needed to identify effective instructional practices for videotape and to determine how students learn from videotapes. This knowledge is essential for designing programs to educate off-campus instructors in the effective use of videotape for delivering agriculture courses.

References

Clark, T. A. & Verduin, J. R. (1989). Distance education: Its effectiveness and potential use in lifelong learning. Lifelong Learning: An Omnibus of Practice and Research, 12(4), 24-26.

Gulliver, K. & Wright, T. (1989). Adult learners, distance education, and technology: It's the future, but can we get there from here? Proceedings of the 8th National Conference on Adult and External Degree Programs. Tampa, FL.

Lehtola, C. J. & Boyd, M. M. (1992). Agricultural Safety: Effective teaching strategies and technological solutions. American Society of Agricultural Engineers, 8(4), 433-437.

Newcomb, L. H. (1993). Transforming university programs of agricultural education. Journal of Agricultural Education, 34 (1), 1-10.

Wilson, C. (1991). Trends in distance education: A viable alternative for higher education (ERIC Document Reproduction Service No. ED 337 081).

AGRICULTURAL DISTANCE EDUCATION: A VALID ALTERNATIVE FOR HIGHER EDUCATION?

A Critique

Blannie E. Bowen, The Pennsylvania State University--Discussant

By focusing on distance education, the authors examine a timely topic that is of high interest to most universities. They begin their paper by doing a credible job of limiting their research to one dimension of distance education, i.e., videotaped instruction. However, as one delves into the conceptual basis they provide for their research, the reader will perhaps find it difficult to assess what research and theory tell us about distance education versus what scholars perceive to be true. For example, they indicate that cost-benefit analyses favor distance learning and that the academic degrees of distance learners are gaining acceptance. Are these research findings or mere conjecture? More clarity is needed so the reader can effectively discriminate fact from opinion.

As the reader moves into the study, one must question whether or not their two objectives should not be restructured to provide more depth. For example, the authors indicate that their objectives were to (1) describe the demographic characteristics of 78 students who enrolled in degree programs offered by videotape through the College of Agriculture at Iowa State and (2) assess these students' attitude toward videotaped instruction. As presented, the objectives do not provide much insight. With this line of inquiry, the one-shot case study approach does not effectively lend itself to the generation of much new knowledge. A comparison group such as students who pursue degrees through the National Technological University would provide more depth and knowledge relative to this topic. As this study was conducted, the authors apparently assume that because this is a new mode of delivery for agricultural educators, others are not delivering similar types of instruction. The question that begs to be explored is how these Iowa State students compare with similar students who pursue degree programs through distance education.

In total, the authors used sound procedures and resisted the temptation to infer beyond their population of 78 students. However, as one reads their paper, one methodological question should be posed relative to the logic behind one of their analysis procedures. Why compute a measure of internal consistency for an attitudinal scale of 13 items (alpha of .83) and then treat the 13 items as individual variables? Do you have one measure of attitude toward videotaped instruction as presented in Table 5 or 13 individual variables as presented in Table 6?

From a futuristic perspective, the authors found that students who enroll in these degree programs are positive about this method of offering degrees. This should not be surprising. The mean age of the students was 35 and virtually all were employed full-time. This was about the only alternative they had to pursue a college degree in agriculture.

Where do we go from here? The first three recommendations the authors present are not especially insightful. One assumes that good college instructors routinely examine the demographic traits of their students. In addition, faculty and not academic administrators are responsible for developing, delivering, and evaluating courses and degree programs, including those offered via distance education. Of their five recommendations, the last is most insightful: additional research is needed to identify effective instructional practices and how students learn from videotape. This study clearly documents that these Iowa State students are positive about this alternative. One hopes the authors will continue this line of inquiry, especially as it relates to making other distance education models available to this and similar audiences.

THE RELATIONSHIP BETWEEN LEVELS OF COGNITION OF INSTRUCTION AND LEARNING STYLE OF HORTICULTURE TEACHERS

Jamie Cano
Associate Professor
Department of Agricultural Education
The Ohio State University

Susan Metzger
Extension Associate
Ohio State University Extension
The Ohio State University

Introduction

When teaching in the classroom, educators need to be cognizant of the contribution to the development of the affective, psychomotor, and cognitive domains of learning. Regarding the cognitive domain, the educational literature (Gall, 1970; Roberts, 1974) has suggested that the emphasis in schools has been teaching students facts, even though teachers and curriculum designers attested to the importance of teaching students to think.

Supporting Gall's (1970) and Roberts' (1974) findings, studies conducted in agricultural education at the secondary level found that teachers concerned themselves with the subject matter students learned, more so than the cognitive level of their instruction (Cano & Newcomb, 1990). If insufficient instruction occurs at the higher levels of cognition, then students are not graduated adept at problem solving, analysis, and evaluation (Newcomb & Trefz, 1987).

The use of problem solving, analysis, and evaluation skills are also related to how students learn (Witkins, 1973). Furthermore, the art of delivery, and teaching method utilized, makes a difference in how a student learns (Koppleman, 1980; Dunn & Dunn, 1979). Gregorc (1979) claimed that "individuals all have the basic capability to learn and teach; however, they are not all able to learn and teach effectively in the same exact way" (p. 234-237).

Agricultural education professionals (Rollins & Scanlon, 1991; Cano, Garton, & Raven, 1992; Cox, Sproles, & Sproles, 1988) have been examining differences among teachers of agriculture in an effort to better prepare teachers of agriculture. Research to date has concluded that not all students learn the same, just as not all teachers teach the same (Raven, Cano, Garton, & Shelhamer, 1993; Rollins & Scanlon, 1991; Cano, Garton, & Raven, 1992; Cox, Sproles, & Sproles, 1988; Rollins, Scholl, & Scanlon, 1992). The teacher must learn to be flexible enough to adjust to a learner's learning capability (Koppleman, 1980; Gregorc, 1979).

The flexibility for learners to learn at higher levels of cognition begins with the teacher's style of learning and the levels of cognition that are utilized in the classroom (Dunn & Dunn, 1979). What is not known however, is the level of cognition of classroom instruction, nor the learning styles of horticulture teachers.

Purpose and Research Questions

The purpose of the study was to determine horticulture teachers' learning style and cognitive level of instruction. In addition, the study sought to determine if any relationship existed between learning style and level of cognition of instruction. In an effort to achieve the purpose of the study, the following research questions were developed:

1. What was the learning style of horticulture teachers?

2. What was the cognitive level of instruction utilized by horticulture teachers?

3. What was the relationship between the learning style and cognitive level of instruction of horticulture teachers?

Procedures

The target population for the study was horticulture teachers in a selected state (N=89). The horticulture teachers purposefully selected for the study (n=11) were from the central region of the state. The responding sample (n=9) included three female and six male teachers of horticulture. Due to sample selection techniques, the results of the study were generalizable to only the responding sample.

The Group Embedded Figures Test (GEFT) (Oltman, Raskin, & Witkin, 1971) was administered to determine the preferred learning style of the teachers. Teachers who scored above the national mean of 11.4 were considered to be field-independent learners and those teachers who scored below the national mean (11.3) were considered field-dependent learners.

The GEFT is considered to be a standardized instrument. The validity of the GEFT has been established by determining its relationship with the parent test the Embedded Figures Test (EFT) (Witkin, Oltman, Raskin, & Karp, 1971). The correlations between the GEFT and the EFT ranged from .84 to .90 (Witkin et al, 1971). The reliability coefficient for the GEFT is .82 (Witkin et al., 1971).

The Florida Taxonomy of Cognitive Behavior (FTCB) (Brown, Ober, Soar, & Webb, 1968) was designed to identify specific cognitive behaviors of teachers. The FTCB is a derivative of the Taxonomy of Educational Objectives in the Cognitive Domain which was developed by Bloom, Englehart, Furst, Hill and Krathwohl (1956). Because the FTCB is derived from Bloom's Taxonomy, it can be considered valid in identifying behaviors at various levels of cognition (Miller, 1989; Whittington, 1991). Reliability of the FTCB is dependent upon the raters' utilization of the instrument (Pickford, 1988; Whittington, 1991). In the current study, a single rater observed all the teachers. The inter-rater reliability was determined to be .94.

Participants for the study were administered the GEFT during a district meeting for agricultural instructors. The GEFT was administered and scored by a consultant who had extensive experience with the GEFT.

Use of the FTCB instrument involved the categorization of cognitive behaviors observed during classroom (50 minute) observations. The teachers were observed three times during a three-month period at two-week intervals. All classroom observations were audio recorded. The observer noted statements reflecting each six-minute transition point as recommended for using the FTCB.

Analysis of Data

To analyze the data regarding the learning styles, the data were hand scored as either correct or incorrect. The total number of correct responses constituted the score for each respective horticulture teacher. The minimum possible score was zero (0) and the maximum possible score was eighteen (18). Learning style scores of the horticulture teachers were reported as field-dependent or field-independent using frequencies and percentages. Additionally, the mean, standard deviation, and range of scores on the GEFT were analyzed.

Cognitive level of instruction was calculated using the process employed by Miller (1989) and Whittington (1991). The total number of behaviors exhibited by the teacher at each of the seven levels was divided by the grand total in order to determine the percentage of behaviors exhibited at the various levels of cognition. Percentage values represented an interval measure of the degree to which each of the teachers' discourse occurred in the various levels of cognition. In addition, means, standard deviations, and ranges of the levels of cognition were calculated.

A single value representing each of the teacher's relative cognitive level of instruction was calculated by multiplying the percentage value of each cognitive level by their respective cognitive weighing values (Miller, 1989; Whittington, 1991; Pickford, 1988). Scores for level of cognition of instruction could range from 0% to 100%.

Relationships were established using Spearman Rank correlations. Correlation coefficients were interpreted utilizing Davis' (1971) descriptors.

Results

Results indicated that 44% of the teachers preferred the field-dependent learning style and 55% preferred the field-independent learning style. A gender analysis indicated that 33% of the females preferred a field-dependent learning style while 67% preferred a field-independent learning style. In addition, the male teachers were split equally at 50% each on either field-dependent or field-independent. The mean learning style score, as measured by the GEFT was 12.7, which was greater than the national mean of 11.4.

Table 1
Cognitive Weighing Values

Levels of Cognition	Value
Knowledge	.10
Translation	.20
Interpretation	.30
Application	.40
Analysis	.50
Synthesis	.60
Evaluation	.70

Table 2
Preferred Learning Styles of Central Ohio Secondary Horticulture Teachers (n=9)

	Learning Style			
	Field-Dependence		Field-Independence	
	f	%	f	%
Females	1	33.3	2	66.6
Males	3	50.0	3	50.0
Total	4	4.4	5	55.6

Note. Mean: 12.7; Standard Deviation: 3.74; Range: 4 - 16

Of the seven levels of cognition identified by the FTCB, the teachers' taught 47% of the time at the knowledge level; the translation and interpretation levels each accounted for 17% of the cognitive level of teaching. For the application level, the percent was four; analysis accounted for 12% of the cognitive level of instruction; synthesis level of cognition occurred in only 3% of the teachers' teaching. In addition, the teachers taught at the evaluation level of cognition less than 1% of the time. Furthermore, 84% of teaching occurred at the lower levels of cognition (knowledge, translation, interpretation and application). Teaching at higher levels of cognition (analysis, synthesis, and evaluation) occurred 16% of the time.

Table 3
Mean, Standard Deviation, Cumulative Percent, and Range of Cognitive Levels of Instruction of Central Ohio Secondary Horticulture Teachers (n=9)

	Mean	Standard Deviation	Cumulative Percent	Range
Knowledge	46.8	11.5	46.8	31.1-66.8
Translation	16.6	6.1	63.4	6.0-28.3
Interpretation	16.8	2.3	80.2	14.3-20.3
Application	3.7	4.0	83.9	0.0-11.1
Analysis	12.4	10.4	96.3	1.4-32.4
Synthesis	3.1	3.2	99.4	0.0-8.5
Evaluation	.6	1.5	100.0	0.0-4.5

Note. Figures are expressed in percentages

The mean weighted cognitive score for the teachers was 23.03. The mean weighted scores reflected a cognitive level of teaching concentrated near the cognitive level of translation. A moderate positive relationship (r = .32) was found between the teachers learning style and the teachers weighted cognitive level of instruction. Correlation coefficients between the horticulture teachers' GEFT scores and the seven levels of cognition ranged from a substantial negative association (r = -.53) among GEFT and knowledge, to a moderate positive association (r = .41) between GEFT and the application level of cognition.

Table 4
Correlation Coefficients Between Central Ohio Secondary Horticulture Teachers' Learning Style (GEFT) and Weighted Score of Cognitive Level of Instruction and Cognitive Level of Instruction (n=9)

Levels of Cognition	r_s
Weighted Score	.32
Levels of Cognition	
Knowledge	-.53
Translation	.20
Interpretation	.22
Application	.41
Analysis	.26
Synthesis	.05
Evaluation	-.10

Conclusions and/or Recommendations

Teachers of horticulture should be aware of their preferred learning style. With learning style knowledge, teachers would be in a better position to recognize the learning style characteristics of students and adapt their teaching style in a manner to meet the learning styles of students.

Regardless of the score a teacher received on the GEFT, the teacher needs to be aware of his/her learning style and the effect his/her learning style preference will have on teaching. Even if learning style cannot be changed, the levels of cognition used in a classroom can. Field-independent and field-dependent teachers need to inspire students to think at higher levels of cognition.

With regard to cognitive levels of instruction, teachers of horticulture need continual education in this area so as to increase the level of cognition at which they teach. Preservice teachers need to have cognitive development included in their curriculum. In turn, students who are taught at higher levels of cognition (analysis, synthesis, and evaluation) will be better able to think and process at a higher level of thought in horticulture matters. Preservice and current teachers of horticulture need to evaluate their course objectives, lesson plans, assignments, quizzes, and test along with their teaching practices to ensure the attainment of objectives by the students are at higher levels of cognition.

As the scores from the GEFT increased to a preferred field-independent learning style, the percentage of teaching at higher levels of cognition increased. Field-dependent teachers tended to teach at a higher percentage than field-independent teachers at the knowledge level of cognition. Field-independent teachers tended to teach at a higher percentage than field-dependent teachers at the translation, interpretation, application and synthesis levels of cognition. Both field-dependent and field-independent teachers tended to teach equally at the evaluation level of cognition.

References

Bloom, B. S., Englehart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). Taxonomy of educational objectives book 1: Cognitive domain. New York: David McKay Company, Inc.

Brown, B. B., Ober, R. L., Soar, R., & Webb, J. N. (1968). Florida Taxonomy of Cognitive Behavior: Directions. Unpublished manuscript. Gainesville: University of Florida.

Cano, J., Garton, B. L., & Raven, M. R. (1992). Learning styles, teaching styles and personality styles of preservice teachers of agricultural education. Journal of Agricultural Education, 33(1).

Cano, J. & Newcomb, L. H. (1990). Cognitive level of instruction and student performance among selected Ohio production agriculture programs. Journal of the American Association of Teacher Educators in Agriculture, 31(1).

Cox, D. E., Sproles, E. K., & Sproles, G. B. (1988). Learning style variations among vocational agriculture students. Journal of the American Association of Teacher Educators in Agriculture, 29(1).

Davis, J. A. (1971). Elementary survey analysis. New Jersey: Prentice-Hall, Inc.

Dunn, R. S. & Dunn, K. J. (1979). Learning styles/teaching styles: should they...can they...be matched? Educational Leadership, 36, 238-244.

Gall, M. D. (1970). The use of questions in teaching. Review of Educational Research, 40(5), 707-721.

Gregorc, A. F. (1979). Learning/teaching styles: Potent forces behind them. Educational Leadership, 36, 234-237.

Koppleman, K. (1980). The relationship of cognitive style to teaching style. Paper presented to the Midwest Educational Research Association, Toledo, OH. (ERIC Document Reproduction Service No. ED 194 609)

Miller, C. (1989). Cognitive levels of instruction and student performance in College of Agriculture courses. Unpublished doctoral dissertation, Columbus: The Ohio State University.

Newcomb, L. H. & Trefz, M. K. (1987, February). Levels of cognition of student tests and assignments in the College of Agriculture at The Ohio State University. Proceedings of the Central Region 41st Annual Research Conference in Agriculture Education, Chicago.

Oltman, P. K., Raskin, E., & Witkin, H. A. (1971). Group Embedded Figures Test. Palo Alto, CA: Consulting Psychologists Press.

Pickford, J. C. (1988). Selected student and professor variables related to cognitive achievement in College of Agriculture courses. Unpublished Master's thesis, Columbus: The Ohio State University.

Roberts, N. (1974). Further verification of Bloom's taxonomy. Journal of Experimental Education, 16-19.

Raven, M. R., Cano, J., Garton, B. L., & Shelhamer, V. (1993). A comparison of learning styles, teaching styles, and personality styles of preservice Montana and Ohio agriculture teachers. Journal of Agricultural Education, 43(1).

Rollins, T. J. & Scanlon, D. (1991). Cognitive, perceptual, and instructional preferences of agricultural education students. Journal of Agricultural Education, 32(3).

Rollins, T. J., Scholl, J., & Scanlon, D. (1992). The learning styles of youth in nonformal agricultural education programs. Journal of Agricultural Education, 33(1).

Whittington, M. S. (1991). Aspired cognitive level of instruction, assessed cognitive level of instruction and attitude toward teaching at higher cognitive levels. Unpublished doctoral dissertation, The Ohio State University, Columbus.

Witkin, H. A. (1973). The role of cognitive styles in academic performance and in teacher-student relations. Princeton, NJ: Educational Testing Service. (ERIC Document Reproduction Service No. ED 083 248)

Witkin, H. A., Oltman, P. K., Raskin, E., & Karp, S. A. (1971). Manual: Embedded Figures Test, Children's Embedded Figures Test, Group Embedded Figures Test. Palo Alto, CA: Consulting Psychologists Press.

THE RELATIONSHIP BETWEEN LEVELS OF COGNITION OF INSTRUCTION AND LEARNING STYLE OF HORTICULTURE TEACHERS

A Critique

Blannie E. Bowen, The Pennsylvania State University--Discussant

Several agricultural educators have studied learning styles and level of cognition of instruction since the late 1980s. The authors are to be complimented for reviewing this and related research in developing a conceptual basis for their study. However, there is a shortcoming in the connection between the prior research and their objectives. The authors cite a wealth of related research but do not effectively inform the reader about the findings. Also, the rationale for studying horticulture teachers is not especially clear. Were horticulture teachers not included in the samples that other researchers studied? This should be clarified because the reader might assume that the prior research involved horticulture teachers. If there are no analyses for this group of teachers, the authors should so indicate.

Also, because their rationale is not explicit, the reader must assume that the primary reason the authors studied only nine teachers was to provide depth. Do the related studies include a limited number of teachers? In addition, the authors indicate that their research involves teachers in a selected state. However, their tables present findings for teachers in central Ohio. If there is a concern about keeping the identify of the population a secret, care must be exercised to not report this type of information. Also, the authors indicate that the teachers were chosen purposively. It would be helpful to know the rationale as well as the process used in making the selections. From a methodological perspective, the authors report a complimentary inter-rater reliability coefficient of .94 for the single person who observed the nine teachers. But, with only one rater, the reader must assume the authors meant intra-rater reliability.

The authors do a good job of presenting their findings. However, more clarity is needed so the reader can make better interpretations. For example, the authors report that they used the Spearman rho coefficient to assess relationships. This procedure is typically used to assess agreement between two groups of rankings. However, in their narrative, the term relationship is used in such a matter that the reader might assume that another analysis procedure was used. As presented, the reader could assume the authors used Pearson's r or similar procedures. In a related vein, the authors should be cautioned against using percentages to present findings for only nine subjects. The approach they used is somewhat misleading. For example, they studied three female teachers and six males. Reporting that 33% of female teachers (1 person) had a particular style leads the reader to assume that more subjects are involved. Also, more details about the rankings for learning style and level of cognition will enhance clarify. Finally, the authors should resist the temptation to infer to a population. They make conclusions and recommendations for all current and future horticulture teachers. If the authors wish to make such inferences, they should replicate their study or examine a random sample of horticulture teachers.

Where do we go from here? The authors found that the level of cognition for the instruction in horticulture is not as high as they apparently would desire. Also, what are the implications for teachers being field independent or field dependent? What can be done to change this situation? Enhanced discussion will provide more insight into the questions posed in this study. Also, given David McCracken's excellent lecture at the end of the 1991 NAERM in Los Angeles, the authors are encouraged to elevate the level of their inquiry. Given the amount of research they cited, hypothetical relationships could be tested with more rigorous designs. Overall, the authors are to be complimented for this exploratory research. One hopes that this inquiry will continue but with greater depth and precision.

COGNITIVE LEARNING STYLE PREFERENCES OF THE MINNESOTA FARM BUSINESS MANAGEMENT EDUCATORS

Richard Joerger
Agricultural Education Lecturer
Continuing and Vocational Education
University of Wisconsin - Madison

Edgar P. Persons
Professor
Vocational and Technical Education
University of Minnesota

Introduction

Since the initial pilot studies of the Minnesota farm business management program in 1952, farm business management (FBM) educators have assisted farmers in meeting their family financial goals. FBM education focuses on using the resources of the farm families in ways to facilitate the family in meeting their goals (Persons & Palan, 1974; Warner, 1990). The learner-centered instructional program goals are met through programmatic group and individualized instruction. Some of the key goals of the farm management education program are to: (a) develop an understanding of the functions of management; (b) stimulate individuals and families to establish their short, intermediate and long-term goals; (c) create an awareness and skills for keeping accurate business and family records; (d) develop skills for analyzing and interpreting farm business records; and (e) acquire the ability to apply economic principles of business management and operation (Warner, 1990).

Along with a high level of satisfaction and learning, farmers report a financial return of over $3000 per year as a result of their enrollment in the FBM program (Richardson, 1979; Persons, Lehto, Casey & Wittenberg, 1987). In addition to the efforts of the farmers, a large share of the educational success of the program may be attributed to how well the FBM educators have understood and met the educational needs of the farm operators.

Researchers have addressed a variety of the contextual variables (Biddle & Dunkin, 1974) associated with farmers enrolled in the farm business management program. For example, Baerg and Leske (1993) found that there was a variety of cognitive learning styles among farmers served by the FBM educators. Earlier Klingbeil (1992) identified the primary sources of information used by adults enrolled and not enrolled in the farm business management program to make management decisions. However, what do we know about the presage variables associated with the FBM educators (Biddle & Dunkin, 1974)? For example, how do they prefer to perceive and transform information into knowledge? What are their characteristic cognitive learning styles? Cano and Garton (1993) noted that teachers vary greatly with regard to their personality and learning styles.

What is cognitive style and what are the characteristic cognitive learning style preferences of the FBM educators of Minnesota who teach over 5,000 farmers each year? Cognitive learning styles refers to the way learners perceive and process information as they adapt to their changing environments (Kolb, 1984). Cognitive learning style is shaped by heredity, undergraduate education, professional roles, and specific job tasks (Kolb, 1984). Some researchers suggest that knowledge of the learning styles of learners may assist educators in predicting how learners are likely to remember, compare, focus, select and analyze information (Hiemstra & Sisco, 1990). Knowledge of learning style is purportedly useful for helping individuals select forms of instruction (McCarthy, 1981; Svinicki & Dixon, 1987), programs of study (Kolb, 1984), and careers (Kolb, 1981, 1984). McCarthy (1981) and Svinicki & Dixon (1987) suggest that knowledge of learning styles is valuable for teachers for designing and delivering instruction. However, since there is a limited amount of research regarding the learning styles of FBM educators, it is difficult to appropriately evaluate and apply findings from other studies. Findings of this study may provide some of the initial understandings that are needed to guide learning style-based preservice and inservice instruction of FBM educators.

Purposes and Objectives

The purpose of this study was to identify the cognitive learning abilities, dimensions, and styles of the farm business management educators of Minnesota. The research objectives that guided the study were to:

1. identify the learning ability preferences of the farm business management educators;

2. identify the learning dimension preferences of the farm business management educators; and,

3. determine the cognitive learning styles of the farm management educators.

Procedures

A pencil and paper survey methodology was used to conduct this descriptive census study of 131 participants. Data were collected using a demographic form and Kolb's 1985 Learning Styles Inventory (LSI). Kolb's 1985 Learning Style Inventory (LSI) and the demographic form were administered by a research assistant to each of the farm management educators during an annual inservice workshop. After follow-up procedures were completed 129 of the 131 adult educators returned completed instruments.

The demographic form consisted of questions regarding gender, age, preservice programs of study, inservice and graduate studies, secondary teaching experience, farm business management teaching experience, and ethnicity.

Kolb's 1985 LSI is a 12 item rank-order pencil and paper survey instrument that is used to describe the learning ability, dimensions, and learning styles of participants. The LSI is based on experiential learning theory. Experiential learning theory and the resulting four stage experiential learning model offer a holistic view on learning that combines experience, perception, cognition, and behavior (Kolb, 1984). During the initial stage of the experiential learning cycle, the learner is involved in real-life concrete experiences. These experiences form the references for the second stage, reflective observation, which are formulated into concepts and theories by the learner during the third stage, abstract conceptualization. The theories and concepts are then applied in real situations during the fourth stage of the learning cycle, active experimentation. The learning cycle then starts over again; however, the learner has the knowledge created from the previous cycle.

The four stages of the experiential learning model--concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE)--are synonymous with the learning ability measures of the LSI. The scores of the learning ability measures are combined to form the information perception dimension (AC minus CE) and the information processing dimension (AE minus RO). Depending on the extent to which the participants use the learning abilities within each learning dimension, they are categorized as possessing a diverger, assimilator, accommodator, or converger learning style.

Analysis of Data

The SPSS/PC+, Version 4.0 (Norusis/SPSS, Inc., 1990) computer software was used to analyze the data and to provide the descriptive statistics for this study. Alpha was established at .05 a priori.

of selected demographic characteristics of the farm business management educators is included along with the learning ability, learning dimension, and learning style measures of the FBM since few states other than Minnesota implement a program that focuses primarily on financial management education.

Selected Demographic Data

Fifty-one (40.18%) of the nearly all white (99.20%) male (98.40%) educators were between the ages of 41 and 50. Agricultural Education was the undergraduate program of study for 106 educators. Bachelors and masters degrees were completed by 116 (91.30%) and 45 (36.00%) of the educators, respectively. Before teaching farm business management adults for an average of 9.79 (SD 7.38) years, the educators taught agricultural education to grades 9-12 students an average of 5.67 years (SD 6.36).

Learning Abilities

Learners prefer to use relative amounts of four learning abilities--concrete experience, reflective observation, abstract conceptualization, and active experimentation--to complete each cycle of experiential learning (Kolb, 1984). Data in Figure 1 suggest that farm business management (FBM) educators indicated an initial preference (mean 34.28, SD 6.61) to make applications of ideas to real-life situations (active experimentation), followed by (mean 33.76, SD 7.62) solving situations through creation of systematic plans and ideas (abstract conceptualization) and (mean 28.45, SD 7.18) careful reflection and observation (reflective observation). The FBM educators indicated they least preferred (mean 23.40, SD 6.83) to be involved in learning situations to gain new information in which they were primarily interacting with other people (concrete experience).

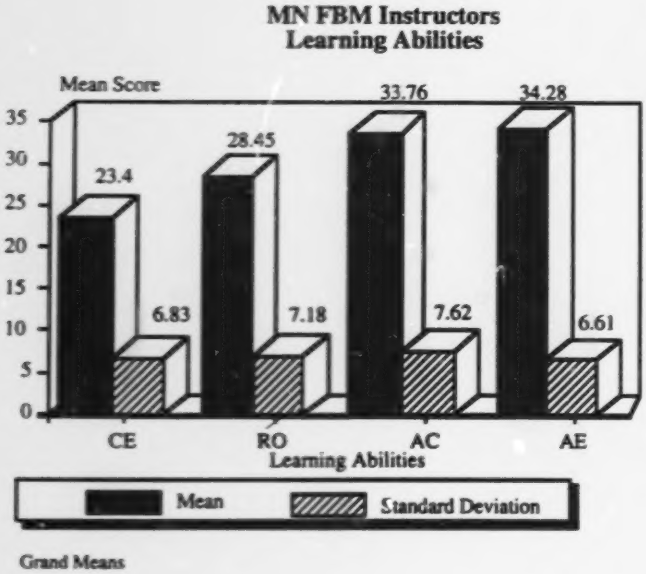


Figure 1
Learning Ability Measures of Farm Business Management Education

Learning Dimensions

Perception and transformation are the two learning dimensions in Kolb's experiential learning model. Although the farm business management educators (FBM) used concrete and abstract conceptualization perception strategies, the perception dimension (AC minus CE) data (mean 10.47, SD 12.27) in Figure 2 suggest the educators indicated a greater preference to perceive new information through thinking processes (abstract conceptualizations) as opposed to feeling strategies (concrete experiences).

The FBM educators indicated a preference (mean 6.75, SD 11.30) to process information (AE-RO) into knowledge through practical applications (active experimentation) to a greater degree than through reflection (reflective observation). Said differently, the FBM educators preferred to directly apply information to real life problems as opposed to using reflection to convert the information into knowledge.

Learning Styles

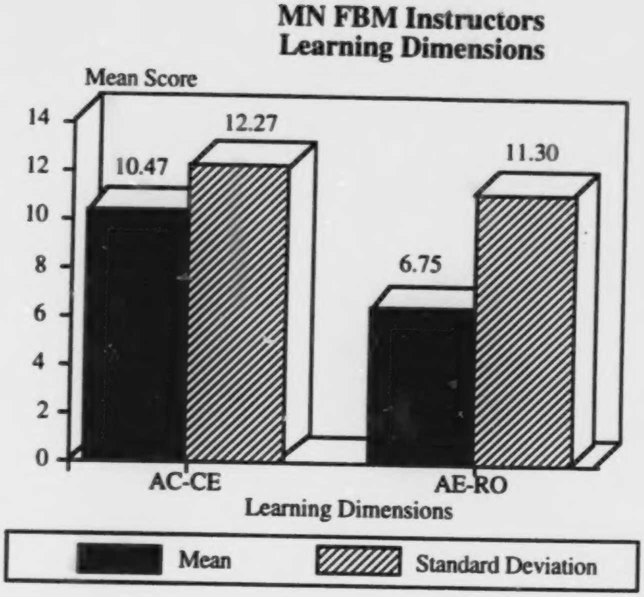
When the learning dimension scores were combined, one of four learning styles was determined for each educator. Participants were classified as having either a(an) diverger, assimilator, converger, or accommodator learning style.

The data in Figure 3 indicate that 49 (37.98%) of the educators were convergers, 41 (31.78%) assimilators, 24 (18.60%) accommodators, and 15 (11.63%) divergers. As convergers, the 49 FBM educators preferred to apply proven and accepted theory, ideas, and concepts to bring about desired solutions to real-life situations (Kolb, 1984).

The 24 FBM assimilators indicated a tendency to learn, construct, and critique new theories and concepts through the use of observations and further reflections. According to Kolb, these educators are the thinkers who are often intrinsically satisfied without applying their theories in real life.

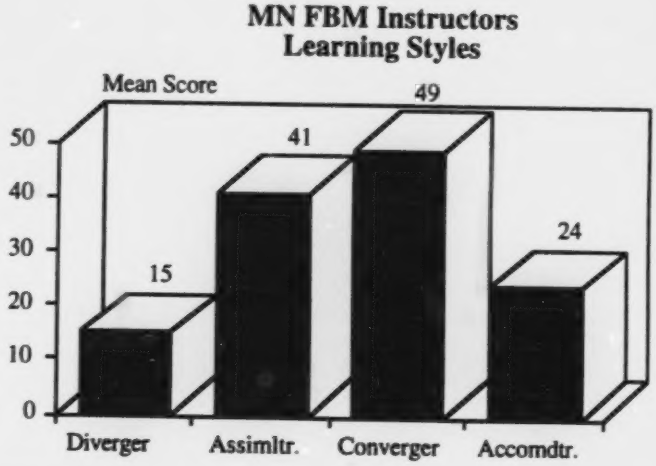
The 24 accommodators, on the other hand, were occasionally risk-takers who likely enjoyed carrying out plans and tasks and becoming involved in new experiences. Unlike assimilators, the FBM educators who were accommodators sometimes have a tendency to make decisions without considering all pertinent information (Kolb, 1984).

The 15 imaginative and feeling-oriented FBM educators who were divergers likely had a tendency to maintain a strong interest in people. In addition, they preferred to learn in social settings in which various perspectives on problems and issues are thoroughly discussed (Kolb, 1984). According to Kolb, these divergers are criticized as being skilled in discussing issues and problems from many perspectives. However, they often do not take appropriate actions to resolve the issues or solve the problems.



Grand Means

Figure 2
Learning Dimensions of FBM Eductors



1985 Kolb Learning Style Inventory

Figure 3
Learning Styles of FBM Educators

Conclusions And Recommendations

The data indicate the primarily male adult educators of farm business management had somewhat similar educational and teaching backgrounds. However, they had a variety of cognitive learning styles. Being primarily convergers and assimilators, the majority of the educators indicated a preference for perceiving information through abstract means. They were divided on their use of active experimentation activities and reflection as the strategies to transform the information into knowledge. These findings suggest that appropriate instruction at the preservice and inservice levels must integrate strategies that are appropriate to the FBM educators with each type of learning style (McCarthy, 1981).

Teacher educators and managers of farm business management adult educators should develop appropriate inservice programs and use appropriate instructional methods to take advantage of what is known about the preferred learning styles. Until additional study is completed, preservice and inservice educators may pattern their instructional efforts after the work of Svinicki and Dixon, (1987) and McCarthy's Model (1981). McCarthy, who used Kolb's LSI for determining learning style, proposed a comprehensive approach to instruction that sought to meet the needs of participants with strong preferences for each of the learning abilities by systematically incorporating preferred learning situations. For example, participants with a strong preference for concrete experience (feelings) prefer to learn by being immersed in discussion groups or personalized counseling. Lectures and opportunities to observe are preferred by learners with a strong reflective observation (seeing) learning preference. Likewise, learners who have a strong preference for using abstract conceptualizations (thinking) appreciate clear and well-structured presentation of ideas along with supportive instructional materials. Learners with a strong preference for use of the active experimentation learning ability (doing) enjoy projects and opportunities for practice and feedback (Smith and Kolb, 1986). McCarthy contended that learners should learn to adapt to various learning situations even though they have strong learning style preferences.

There are, however, many unanswered questions regarding learning style that can be addressed by adult and agricultural education researchers. The following recommendations are offered for consideration:

1. Because of limited evidence pertaining to adult educators and their clients in farm management education, researchers of agricultural education should continue the investigation of questions concerning learning styles so that the profession may be better informed of appropriate principles and practices for program design, curriculum development, and instructional design. For example, additional research may identify relationships that may exist between the learning style of the educators and clients and other variables such as self-efficacy, preferred instructional strategies, satisfaction, achievement, and interpersonal communications.

2. Teacher educators and managers of farm management educators should become involved in inservice educational activities regarding learning styles theory and practice because of the attention to learning styles in the adult education literature, the practice by some practitioners of using learning styles instruments in continuing education settings, and more attention is being given to learning styles research in agricultural education. More specifically, adult educators in farm management should be taught how to properly administer, interpret, and use the results of selected learning style instruments.

References

Baerg, G. & Leske, G. (1993). A description of the learning styles of farm business management students in southwestern Minnesota. Proceedings of the 47th Central Region Research Conference in Agricultural Education. St. Louis, Mo.

Cano, J. & Garton, B. L. (1993). An assessment of the personality styles of preservice teachers of agriculture education. Proceedings of the 47th Central Region Research Conference in Agricultural Education. St. Louis, Mo.

Curry, L. (1983). An organization of learning styles theories and constructs. Paper Presented at the Annual Meeting of The American Educational Research Association. 67th, Montreal, April 11-15, 1983. (ERIC Document No. 235 185).

Dunkin, M. & Biddle, B. (1974). A study of teaching. New York: Holt, Rinehart, and Winston.

Hiemstra, R. & Sisco, B. (1990). Individualizing instruction: making learning personal, empowering, and successful. San Francisco: Jossey-Bass.

Klingbeil, L. K. (1992). A comparison of information sources used by farmers who enrolled and those who did not enroll in selected farm business management education programs in Minnesota. Unpublished dissertation. Minneapolis: University of Minnesota.

Kolb, D. A. (1985). Learning style inventory, revised edition. Boston: McBer and Company.

Kolb, D. A. (1984). Experiential Learning: Experience as the source of learning and development. Englewood Cliffs, NJ: Prentice-Hall, Inc.

McCarthy, B. (1981). The 4Mat System: Teaching to learning styles with right/left mode techniques. Oak Brook, IL: Excel, Inc.

Norusis, M. J./SPSS Inc. (1990). SPSS/PC+ 4.0 base manual for the IBM PC/XT/AT and PS/2. Chicago, IL: SPSS Inc.

Persons, E. P. & Palan, F. (1974). Farm management education curriculum II. St. Paul: University of Minnesota, Agricultural Education Department.

Persons, E. P., Lehto, D. Casey, M.A., & Wittenberg. (1987). The impact of the Minnesota adult farm business management education program on farm family survival: a study in crisis prevention and intervention. St. Paul, MN: State Board for Vocational and Technical Education.

Richardson, V. A. (1979). The organization, analysis and evaluation of adult farm management programs as they are conducted in Minnesota. Colloquium paper. St. Paul: University of Minnesota.

Smith, D. & Kolb, D. A. (1986). LSI user's guide. Boston: McBer and Company.

Svinicki, M. D. & Dixon, N. M. (1987). The Kolb model modified for classroom activities. College Teaching, 35(4), 141-146.

Warner, J. C. (1990). Farm management state curriculum guide. St. Paul: Minnesota Technical College System - Instructional Services Section.

COGNITIVE LEARNING STYLE PREFERENCES OF THE MINNESOTA FARM BUSINESS MANAGEMENT EDUCATORS

A Critique

Blannie E. Bowen, The Pennsylvania State University--Discussant

The authors do a good job of explaining the Minnesota Farm Business Management program and summarizing the related research. The rationale that they build is based upon several excellent studies. However, given McCracken's excellent lecture at the end of the 1991 NAERM, the authors are encouraged to elevate the level of their inquiry beyond the mere description of learning styles of farm business management instructors. The vast amount of research that they cited should lead the reader to assume that hypothetical relationships ought to be tested with studies that employ more rigorous designs. This precision is needed to elevate agricultural education research to that presented during the AERA annual meetings and that found in related journals. How do the farm business management instructors compare with other agricultural educators? A design beyond a one-shot case study is needed to provide the needed depth.

Overall, the authors are to be complimented for their exploratory research on this topic. Their methods are generally sound and they resist the temptation to go beyond the population of Minnesota farm business management instructors. The reader will be pleased with the crisp manner in which the authors summarize the demographic data. However, the reader must be curious as to why an alpha level of .05 is reported in their analysis section if a population of teachers is being studied. In total, the authors present an excellent discussion of their findings to provide a context for making real world interpretations.

From a comparison perspective, it would be helpful to know how the Kolb (1984) learning style instrument that the authors used compares with the Group Embedded Figures Test (GEFT) instrument that Raven and Shelhamer (1993) and Cano and Metzger (1993) used in two papers presented in this session. Such a comparison will enable the reader to better interpret findings that 56% of the horticulture teachers in Ohio and 70% of the preservice agricultural education majors at Montana State prefer the field independent learning style. How do their findings that 15% of farm management instructors prefer the diverger style, 41% the assimilator, 49% the converger, and 24% the accommodator style compare with those of Raven and Shelhamer (1993), Cano and Metzger (1993), and others who have done similar investigations? Given that all of these studies are measuring preferred learning style, comparisons are needed so the reader can better interpret the findings.

Where do we go from here? The authors present several conclusions and recommendations that are derived from their findings. Most have immediate implications for practice. However, issues mentioned above relative to comparisons will enable the profession to acquire depth and insight into the problem investigated in this study. Are Minnesota farm management educators vastly different from preservice agricultural education majors, horticulture teachers, and 4-H youth educators? Research related to this question and issues relative to how to use knowledge about learning styles is needed to advance our understanding of these complicated matters. The challenge is to better synthesize what we already know and perhaps look for similarities rather than to implicitly assume that selected groups of agriculture teachers have vastly different learning style preferences. Overall, the authors are to be complimented for this exploratory research. One hopes that this inquiry will continue but with greater depth and precision.

THE RELATIONSHIP BETWEEN STUDENTS' ABILITY TO DEMONSTRATE THE PROBLEM SOLVING APPROACH TO TEACHING IN A METHODS CLASS AND THEIR LEARNING STYLES

Matt R. Raven, Adjunct Assistant Professor
Van Shelhamer, Associate Professor
Department of Agricultural and Technology Education
Montana State University

Introduction and Theoretical Base

The problem-solving approach to teaching has been promoted by agricultural educators as being the most effective strategy for teaching agriculture (Osborne & Hamzah, 1989). Other vocational disciplines, such as technology education, are also advocates of the problem-solving approach to teaching. Teacher educators in agriculture have long advocated using the problem-solving approach in the classroom (Binkley & Tulloch, 1981; Crunkilton & Krebs, 1982; Newcomb, McCracken, & Warmbrod, 1986; Phipps & Osborne, 1988). Yet, despite widespread support for problem-solving and the emphasis placed on the approach in agricultural education preservice programs, studies have found that though teachers organize their lessons on a problem-solving basis, they did not generally follow through with actual problem-solving teaching (Boone & Newcomb, 1990; Osborne & Hamzah; 1989). What factors are contributing to this discrepancy between theory and practice?

Ronning, McCurdy, and Ballinger (1984) argued that problem-solving must consider at least three dimensions: knowledge domain, problem-solving methods, and characteristics of learners. Ronning et al. (1984) contended that the first two dimensions (knowledge domain and problem-solving methods) were widely accepted as essential for problem-solving, but there were no theories of problem-solving which took into account systematic individual differences. Ronning et al. (1984) concluded that modification of problem-solving instruction in ways consistent with students' learning styles seems an inevitable consequence. One dimension not considered by Ronning et al. (1984) was the characteristics of the teachers.

Agriculture teachers are unique. Agriculture teachers' learning styles are one characteristic in which teachers of agriculture differ (Cano, Garton, & Raven, 1992a). Learning styles describes the process learners use to sort and process information. Witkin (1973) maintained that learning style is an important factor in students' academic achievement, how students learn and teachers teach, and student-teacher interaction. Research suggests that teachers teach the way they learned (Avery, 1985; Dunn & Dunn, 1979; Gregorc, 1979; Witkin, 1973). Nevertheless, Koppleman (1980) argued that there has been insufficient study of the relationship between learning style and teaching style. Could the learning style of the teacher be a factor in the ability of the teacher to incorporate the fundamentals of problem-solving approach into their teaching? What are the fundamentals to the problem-solving approach? How do learning styles differ?

Warmbrod (1969) proposed a useful summary of the primary premises fundamental to the problem-solving approach to teaching. Fundamental premises in the summary included: student-centered instruction rather than subject-centered; instruction aims of individual development rather than "covering" material; content is organized such that is psychologically meaningful to the student rather than a teacher-dominated process; students share in planning, conducting, and evaluating what is taught and how it is taught; active learning occurs rather than passive; and students "inquire into," rather than being "instructed in" subject matter. How compatible are these premises with the learning styles of agriculture teachers?

Field-dependent and field-independent are two of the most widely studied learning styles (Witkin, Moore, Goodenough, & Cox, 1977). Witkin (1973) has shown that a person who's mode of perception is strongly dominated by the surrounding field is said to be leaning towards a field-dependent learning style. In contrast, a person who perceives items more or less separate from the surrounding field leans more toward a field-independent learning style.

Field-dependent learners perceive globally and find it more difficult to solve problems while field-independent learners perceive analytically and find it easier to solve problems (Witkin et al., 1977). Field-dependent learners as teachers tend to prefer teaching situations that allow interaction and discussion with students. Field-dependent teachers use student-centered activities and utilize questions to check on student learning following instruction. Teachers with field-independent learning styles tend to prefer impersonal teaching situations such as lectures that emphasize the cognitive aspects of instruction. Field-independent teachers prefer learning situations that are centered around the teacher (Garger & Guild, 1984).

However, it is important to note that learning styles are not always clustered into neat categories as described. A person's field dependent/independent learning style score, as measured by the Group Embedded Figures Test (GEFT) (Witkin, Oltman, Raskin, & Karp, 1971), falls along a continuum. A person with a learning style score that falls near the extreme end of the learning style continuum has a stronger preference for that learning style than a person with the same learning style whose score is closer to the middle. Therefore, the designations, "field-dependent" and "field-independent," like the designations, "tall" and "short," are relative (Witkin et al., 1971).

Warmbrod (1969) stressed that the problem-solving approach was student-centered not subject-centered. In contrast teachers with a field-independent learning style prefer an impersonal approach to teaching that emphasizes the subject matter. However, field-dependent teachers prefer student-centered teaching situations where students are active in the learning process. Yet teachers with a field-dependent learning style tend to have difficulties solving problems while field-independent teachers are more analytical and have less difficulty solving problems. Which learning style is best suited for the problem-solving approach to teaching?

Field-dependent teachers might prefer the problem-solving approach because of its focus on the student. However, these same teachers might not use the problem-solving approach because of their difficulty in solving problems. Conversely, teachers with a field-independent learning style might do well with the problem-solving approach because of their ability to solve problems, but do not use the approach because the approach does not focus on the subject matter. Perhaps teachers with learning styles closer to the middle of the continuum possess both field-dependent and field-independent traits that make it easier for them to use the problem-solving approach to teaching.

There has been little research in education which investigated the relationship between a preservice teachers learning style and their ability to utilize the problem-solving approach. Cano, Garton, and Raven (1992b) identified a moderate positive linear relationship between learning style and final score in a microteaching lab and instructional methods course. Cano et al. (1992b) concluded that further research is needed on the relationship between learning styles of preservice teachers and their ability to use the problem-solving approach.

Purpose and Objectives

The purpose of this study was to determine the relationship between preservice agriculture and technology education teachers' preferred learning style and their performance in Methods of Teaching Agriculture and Technology Education--emphasizing the problem-solving approach to teaching. The following research questions were used to guide the study:

1. What were the learning styles of preservice agriculture and technology education teachers in an instructional methods course dealing with agricultural and technology education?

2. Was there a curvi-linear relationship between preservice agriculture and technology education teachers' learning style and their performance in an instructional methods course dealing with agricultural and technology education?

Procedures

Population and Sample

The population for this correlational study was preservice teachers majoring in agriculture education and technology education at Montana State University. The sample was preservice teachers enrolled in a methods of teaching agriculture and technology education course during the Fall Semesters of 1991 and 1992. The sample (n=30) included 23 preservice agriculture teachers and 7 preservice technology education teachers. There were 10 females and 20 males in the sample.

Instrumentation

The Group Embedded Figures Test (GEFT) (Witkin, Oltman, Raskin, & Witkin, 1971) was administered to determine the preferred learning style of the subjects as either field-dependent or field-independent. Subjects who scored above the mean were considered to be independent learners. In contrast, subjects who scored below the group mean were considered to be dependent learners. The GEFT is considered a standardized instrument and has been tested extensively for validity and reliability by the authors of the instrument.

Data Analysis

The GEFT was administered at the beginning of the Fall Semesters of 1991 and 1992. Data were analyzed using SAS. Descriptive statistics were used to answer the first research question. Polynomial regression analysis (Cohen & Cohen, 1983) was used to answer the second research question. Davis' (1971) conventions were used for describing measures of association. Since the sample was not random, results can not be inferred to the population and inferential statistics were not reported.

Preservice teachers' performance in the methods course was measured using two criteria: microteaching laboratory score and final course score. Subjects' final course score was independent of their final lab score. The microteaching laboratory was conducted utilizing the problem-solving approach to teaching, as outlined by Newcomb, McCracken, and Warmbrod (1986). Preservice teachers were required to demonstrate the problem-solving approach to teaching during five microteachings. Each microteaching lesson was evaluated and scored by the same microteaching laboratory instructor each semester. The microteaching evaluations were based on the preservice teachers' ability to demonstrate the problem-solving approach to teaching. The subjects' final course score encompassed quizzes given during the course, a complete unit plan, five lesson plans, two mid-terms, and final examination score, all of which were based on the problem-solving approach.

Findings

Learning Styles

Data showed that nearly two-thirds (19) of the subjects were field-independent learners and the remaining one-third (11) were field-dependent (Table 1). Nearly 70% (16) of the agricultural education students preferred the field-independent learning style. In contrast, 57% of the preservice technology education teachers preferred the field-dependent learning style. The mean GEFT score for all preservice teachers was 12.8 which is higher than the national norm of 11.3 (Witkin et. al, 1971).

Table 1
Preferred Learning Styles of Preservice Teachers by Major (n=30)

	Ag Ed		Tech Ed		All Cases	
Learning Style	f	%	f	%	f	%
Field-Dependent	7	30.4	4	57.1	11	36.7
Field-Independent	16	69.6	3	42.9	19	63.3
Total	23	100.0	7	100.0	30	100.0

Polynomial regression analysis was used to determine if there was a curvilinear relationship between subjects' GEFT score and their performance in the microteaching laboratory and methods class. Polynomial regression utilizes the powers of the independent variable (i.e. the square and the cube of the subjects' GEFT score) to determine whether and how a relationship is nonlinear. By entering the independent variable (linear),then the square (quadratic), and then the cube (cubic) in a hierarchical procedure it is possible to determine whether the relationship is linear or nonlinear by the changes in R^2. If allowing the line to bend one time (the quadratic function) results in a significant change (practical and/or statistical) in the R^2, then the relationship is curvilinear. However, the curvilinear relationship may be more complex than is tested for by the quadratic term. Therefore, the line is allowed to bend a second time (the cubic function) to see if there is a significant change in R^2. In the behavioral sciences it is usually sufficient to enter just the quadratic and cubic terms to determine if there is a curvilinear relationship (Cohen & Cohen, 1983).

Summary data indicated that there was a low association (r=.26) between subjects' GEFT score and their methods class average (Table 2). Students who had a higher class average tended to be more field-independent. There was a substantial relationship (r=.69) between subjects' microteaching lab average and their class average. Summary data showed that the mean score for the microteaching lab was higher than the mean score for the class score with less variance.

Table 2

Summary Data: Regression of Microteaching Lab Average and Final Course Average on GEFT for Preservice Teachers (n=30)

Variable	Intercorrelations			Mean	SD
	(X_1)	(Y_1)	(Y_2)		
GEFT (X_1)	1.0	-.01	.26	12.8	4.4
Lab Average (Y_1)		1.0	.64	90.0	3.6
Class Average (Y_2)			1.0	83.0	7.2

Relationship Between Learning Style and Microteaching Performance

Polynomial regression was to used to ascertain if a curvilinear relationship existed between subjects' GEFT score and their final average in the microteaching lab. The GEFT variable (linear trend) was entered first into the regression. The subjects' GEFT scores explained less than 1% of the variance in the subjects' microteaching lab scores (Table 3). The square of the GEFT variable (quadratic trend) was entered next into the regression. By allowing the line to bend one time, an additional 2% of the variance in the subjects' final lab score was explained. The cube of the GEFT variable (cubic trend) was entered last. By allowing the line to bend a second time less than 1% of additional variance in the subjects' lab score was explained.

Table 3

Regression of Microteaching Lab Average on GEFT for Preservice Teachers (n=30) (Polynomial Entry)

Variables	R^2	R^2 change
GEFT - Linear Trend	.001	.001
GEFT^2 - Quadratic Trend	.020	.019
GEFT^3 - Cubic Trend	.021	.001

Relationship Between Learning Style and Class Performance:

Polynomial regression was also used to determine if there was a curvilinear relationship between subjects' GEFT score and their final class score. The GEFT variable (linear trend) was entered first into the regression. The subjects' GEFT scores explained 7% of the variance in the subjects' class scores (Table 4). The quadratic trend was entered next into the regression. By allowing the line to bend one time, less than 1% of additional variance in the subjects' class score was explained. The cubic trend was entered last. By allowing the line to bend a second time less than 1% of additional variance in the subjects' class score was explained.

Table 4
Regression of Methods Class Average on GEFT for Preservice Teachers (n=30) (Polynomial Entry)

Variables	R^2	R^2 change
GEFT - Linear Trend	.070	.070
$GEFT^2$ - Quadratic Trend	.075	.005
$GEFT^3$ - Cubic Trend	.082	.007

Conclusions and/or Recommendations

Results suggested that preservice teachers enrolled in the instructional methods course differed in their learning styles. Preservice agricultural education teachers tended to be field-independent. This finding was congruent with the statement by Witkin et al. (1977) that "field-independent persons have shown interest in the teaching of vocational agriculture." However, preservice technology teachers tended to be field dependent. Why the difference? One would think that preservice technology education teachers' learning style would be comparable to preservice agricultural education teachers' style because of the similarities in programs. Further research is needed to determine if there are noticeable differences in learning styles between agricultural and technology education students and the resulting implications. Nevertheless, teacher educators need to realize that their students have differing learning styles which require the teacher educator to utilize a variety of teaching techniques to address the different styles.

The results of the regression indicate there was neither a linear or curvilinear relationship between subjects' GEFT score and their microteaching score. Field-independent students were just as likely to do as well or as poorly as field-dependent students. This finding was in contrast to the results of Cano et al. (1992b) which showed that preservice teachers who preferred a field-independent learning style achieved higher scores than preservice teachers preferring a field-dependent style in the microteaching laboratory. The findings also differed from those of Witkin et al. (1977) and Koppleman (1980) who found that teachers possessing a field-independent learning style to be more adapted to teaching using the problem-solving approach. One possible explanation for the discrepancy between this study and the one by Cano et al. (1992b) was the relatively small sample size of both investigations. Additional data needs to be gathered in order to have a more representative sample of the population.

There was not a curvilinear relationship between subjects' GEFT scores and their class scores. However, there was a low positive linear relationship between subjects' GEFT scores and their class score. Students who preferred the field-independent learning style tended to achieve higher scores in class. Additionally, there was a substantial linear relationship between subjects' lab scores and their class scores. Although the lab score was not a part of the class score, one would still expect an even stronger association between the two scores then was found. Perhaps the reason why students did better in lab than in class is because they were able to see the problem-solving approach to teaching demonstrated numerous times during the semester. As a result, both field-dependent and field-independent students had a better idea of how to demonstrate the approach. This reasoning may also explain the lack of the relationship between subjects' GEFT and their lab score. However, in the classroom they were unable to observe how other students did their unit plans, lesson plans, and exams. Possibly, field-independent students were better able to prepare unit and lesson plans and achieve on exams because of their field-independent traits of being cognitive-oriented and being able to provide their own structure to learning situations.

Preservice teachers have a difficult time becoming proficient in the problem-solving approach to teaching. If preservice teachers are not proficient in the problem-solving approach by the time they enter the teaching profession it is doubtful that they will use the approach when in the field. Further research on learning styles of preservice teachers of agriculture and technology education should be conducted in an effort to more effectively train and supervise preservice teachers. Preservice teachers in this study should be tracked to see which ones enter the profession and, of the ones that do, if they utilize the problem-solving approach to teaching. Additionally, research on agriculture teachers' learning styles should be extended to currently practicing agriculture teachers as well as teacher educators.

The problem-solving approach to teaching is one of the foundations of agricultural education. If agricultural teacher educators are going to continue to advocate the use of the problem-solving approach to teaching to preservice teachers then they must find out what prevents preservice teachers from using the approach when they enter the field.

References

Avery, R. E. (1985). An assessment of the relationship between teacher teaching style, student learning style, and the academic achievement of twelfth grade students. University of Massachusetts, Doctoral Dissertation. (DAI No. 46/12A).

Binkley, H. R. & Tulloch, R. W. (1981). Teaching vocational agriculture/agribusiness. Danville, IL: The Interstate Publishers, Inc.

Boone, H. & Newcomb, L. H. (1990). Effects of approach to teaching on student achievement, retention, and attitude. Journal of Agricultural Education, 31(4), 9-14.

Cano, J., Garton, B. L., & Raven, M. R. (1992a). Learning styles, teaching styles, and personality styles of preservice teachers of agriculture. Journal of Agricultural Education, 33(1), 46-52.

Cano, J., Garton, B. L., & Raven, M. R. (1992b) The relationship between learning and teaching styles and student performance in a methods of teaching agriculture course. Journal of Agricultural Education, 33(3), 16-22.

Cohen, J. & Cohen, P. (1983). Applied multiple regression/correlation analysis for the behavioral sciences. Hillsdale, NJ: Lawrence Erlbaum Associates.

Crunkilton, J. R. & Krebs, A. R. (1982). Teaching agriculture through problem solving. Danville, IL: The Interstate Publishers, Inc.

Dunn, R. S. & Dunn, K. J. (1979). Learning styles/teaching styles: should they...can they...be matched? Educational Leadership, 36, 238-244.

Garger, S. & Guild, P. (1984, February). Learning styles: The crucial differences. Curriculum Review, 9-12.

Gregorc, A. F. (1979). Learning/teaching styles: potent forces behind them. Educational Leadership, 36, 234-237.

Jacobs, R. L. (1990). The social behaviors of field independent and field dependent students in a Personalized System of Instruction course. Indiana University, unpublished Doctoral Dissertation.

Koppleman, K. (1980). The relationship of cognitive style to teaching style. Paper presented to the Midwest Educational Research Association, Toledo, OH. (ERIC Document Reproduction Service No. ED 194 609).

Newcomb, L. H., McCracken, J. D., & Warmbrod, J. R. (1986). Methods of teaching agriculture. Danville, IL: The Interstate Publishers, Inc.

Osborne, E. W. & Hamzah, R. (1989). Use of problem solving teaching among secondary agriculture teachers in Illinois. Journal of Agricultural Education, 30(3), 29-36.

Phipps, L. J. & Osborne, E. W. (1986). Handbook on agricultural education in public schools. Danville, IL: The Interstate Publishers, Inc.

Raven, M. R. & Shelhamer, V. (1992). Selected characteristics of preservice agricultural teachers in Montana. Proceedings of the 19th Annual National Agricultural Education Research Meeting, XIX, 441-448, St. Louis, MO.

Ronning, R. R., McCurdy, D., & Ballinger, R. (1984). Individual differences: A third component in problem-solving instruction. Journal of Research in Science Teaching, 21(1), 71-82.

Warmbrod, J. R. (1969, April). Some myths about problem solving. The Agricultural Education Magazine, 231-232.

Witkin, D. B. (1973). The role of cognitive style in academic performance and in teacher-student relations. Research Bulletin. Princeton, NJ: Educational Testing Service.

Witkin, H. A., Moore, C.A., Goodenough, D. R., & Cox, P. W. (1977). Field-dependent and field-independent cognitive styles and their educational implications. Review of Educational Research, 47(1), 1-64.

Witkin, H. A., Oltman, P. K., Raskin, E., & Karp, S. A. (1971). Group Embedded Figures Test manual. Palo Alto, CA: Consulting Psychologist Press, Inc.

THE RELATIONSHIP BETWEEN STUDENTS' ABILITY TO DEMONSTRATE THE PROBLEM SOLVING APPROACH TO TEACHING IN A METHODS CLASS AND THEIR LEARNING STYLES

A Critique

Blannie E. Bowen, The Pennsylvania State University--Discussant

The authors begin their study with a detailed summary of related research on learning styles and the problem solving approach to teaching. As with most studies, their research raises more questions than it provides answers. Comments provided on earlier papers presented by Cano and Metzger (1993) and Joerger and Persons (1993) are also germane to this paper. Is there not enough already known about the learning styles of teachers to elevate the level of this inquiry to the testing of hypothetical relationships as recommended by McCracken in 1991? In developing their conceptual framework, the authors are challenged to use more of the findings of related research. In this regard, the reader will be intrigued with their statement that teachers of agriculture are unique. A major assumption that the authors make in developing their conceptual framework is that teachers of agriculture have different learning styles. Taken at face value such an assumption is perhaps true. Yet the findings of their study and those of Cano and Metzger (1993) perhaps point to more similarities than differences.

From a methodological perspective, the study is generally sound. However, the reader will be intrigued with their research question that a curvi-linear relationship was expected between learning style and students' performance in a methods course. Given the research they cited, such a question should perhaps be stated more in line with the findings of prior studies. Also, a stronger rationale is needed for pooling the agricultural education and technology education students into a single study. Other than the fact that the 30 students were enrolled in the same course, the reader will be pressed to find the logic for such a comparison. Also, given that 23 of the 30 students were agricultural education majors, the rationale for pooling needs to be clarified.

Where do we go from here? When the reader examines the findings, conclusions, and recommendations, several questions will emerge relative to the use of the problem solving approach. If the reader accepts the validity of this study and the authors' implicit assumption that preservice students should function in a manner similar to teachers, then several implications for practice are bound to emerge. Also, their findings that learning style is not a good explanation for the students' microteaching performance or final course average are not unexpected. The variability of teachers and the limited exposure that most undergraduates have to the problem approach in either high school or college mean that students with various learning styles are being attracted to the agricultural education major. Collectively, the authors' findings raise intriguing questions for practice. If learning style preferences are stable and a particular style is needed to effectively use the problem solving approach, how are methods course instructors to deal with this issue? Should only students with the desired style be encouraged to pursue teaching? Can methods courses be structured to enable field independent as well as field dependent students to better use the problem solving approach?

Overall, the authors are to be complimented for their exploratory research on this topic. One hopes that this inquiry will continue but with greater depth and precision.

NAERM Second Session
8:30-10:00 a.m.
Concurrent Session D

Theme: Farm Business Management and Extension Education Programs

Topic 1: Self-perceived leadership effectiveness of county extension directors: A national perspective

Speakers: Rama Radhakrishna, Ed Yoder, Connie Baggett (The Pennsylvania State University)

Topic 2: A study of the adoption and non-adoption of approved practices by Minnesota dairy farm operators

Speakers: Earl Bracewell, Edgar Persons, Abderrazak Lakjaa, Chunju Chen (University of Minnesota)

Topic 3: A comparison of information sources used by farmers who enrolled and those who did not enroll in selected farm business management programs in Minnesota

Speakers: Larry Klingbeil (East Texas State University)
Edgar Persons, Chunju Chen (University of Minnesota)

Topic 4: The application of servqual in measuring the quality of service provided by Minnesota extension service (MES)

Speakers: Chunju Chen, Gary Leske, Richard Krueger (University of Minnesota)

Discussant: Arlen Etling (The Pennsylvania State University)

Chairperson: Larry Arrington (University of Florida)

Facilitator: Alfred Mannebach (University of Connecticut)

SELF-PERCEIVED LEADERSHIP BEHAVIORS AND PRACTICES OF COUNTY EXTENSION DIRECTORS: A NATIONAL PERSPECTIVE

Rama B. Radhakrishna, Research Associate
Edgar P. Yoder, Associate Professor
Connie D. Baggett, Associate Professor
Department of Agricultural and Extension Education
The Pennsylvania State University

Introduction

The role of the county extension director (CED) has expanded from one basically of maintenance of county extension office and supervision of secretarial staff to one with responsibility for the entire extension program at the county level (Brown, 1991). The CED serves as an administrative leader and coordinator for formulating, developing, implementing and evaluating county extension programs. Also, the CED is a vital link between field staff and upper levels of management. Given these roles and responsibilities, the CED is expected to function as a leader within the county extension organization. Therefore, the CED's leadership role has become a critical element in the successful implementation of county extension programs.

The leadership role of extension professionals has been examined by a number of researchers. Cobb (1989) examined the self-perceived leadership effectiveness of county extension directors in the North Carolina Agricultural Extension Service. In addition, subordinate (agent) perceptions of CED leadership effectiveness were also examined. Findings indicated no difference in the leadership effectiveness as perceived by extension agents and the CEDs. CED tenure, CED area of responsibility or program discipline, were not related to perceived CED leadership effectiveness.

Holder, Denk, and Rodriguez (1992) identified leadership styles and leadership practices of New Mexico Cooperative Extension Service faculty and middle managers (CEDs). They compared the self-assessed leadership practices of the middle managers in the New Mexico Cooperative Extension Service to the faculty perceptions of middle managers' leadership practices. The faculty rated the leadership effectiveness of middle managers lower than the managers rated themselves. Middle managers preferred the delegating style of leadership, which is generally viewed as reflecting lower levels of direction and support. Faculty, however, did not prefer the delegating leadership style to the extent the middle managers did. Leadership style of faculty and middle managers was not related to gender, age, ethnic origin, highest education level, years of extension experience, and area of responsibility.

Distasio (1985) examined the leadership styles of Connecticut school superintendents. Using the Least Preferred Co-Worker Scale (LPC) developed by Fiedler, Chemers and Mahar (1976), he found that 73% of the teachers preferred the task-oriented leadership style, while 27% preferred the relations-oriented leadership style.

According to Kouzes and Posner (1988), leadership is an observable and learnable set of practices. Individuals who possess the desire and persistence to lead, may enhance their skills and abilities required for the leadership role. Identifying leadership styles, behaviors and practices would be useful information for contributing to the professional growth and development of the individual CED and also help them assess the attainment of organizational goals. Thus, this study examined the self-reported leadership styles, behaviors and practices of CEDs.

Purpose and Objectives

The major purpose of this study was to determine leadership styles, behaviors, and practices of CEDs. Specific objectives of the study were to:

1. Identify leadership styles of CEDs.

2. Determine self-perceived leadership behaviors and practices of CEDs.

3. Determine team concepts that exist among county extension staff.

4. Determine if there was a relationship between team concept and leadership behaviors and practices of CEDs.

5. Determine if there was a relationship between demographic characteristics and leadership behaviors and practices of CEDs.

Methods and Procedures

Population and Sample

The population for this study consisted of all county extension directors listed in County Agents: The Reference Directory of Agricultural Extension Workers (1993-94), (73rd Edition). A random sample of 307 county extension directors was selected for the study which reflects a 5% margin of error with a 5% risk of drawing a bad sample (Krejcie & Morgan, 1970). Since the titles vary across different states, a common title "County Extension Director (CED)" was used.

Instrumentation

A questionnaire developed by Cobb (1989) was modified and used to collect data for the study. In addition, the 18-item Least Preferred Co-Worker Scale (LPC) developed by Fiedler et al. (1976), which identifies leadership style on a continuum ranging from 1 to 8, was used. Scores for the summated LPC scale could theoretically range from a low of 18 to a high of 144. A score of 64 or more is considered as a high score and is associated with the relation-oriented leadership style. A score of 57 or less is considered as reflecting a task-oriented leadership style.

The questionnaire had four sections. Included in the questionnaire were: 1) the LPC scale, 2) 98 statements reflecting 12 dimensions of CED leadership behaviors and practices with a response scale that ranged from 1 "Never" to 5 "Always," 3) eight items that measured team concepts, and 4) questions related to demographic and administrative characteristics. The conceptual definitions for the 12 CED leadership behavioral practices are shown in Chart I.

The questionnaire was reviewed by a four-member, panel of experts (faculty and specialists) to establish face and content validity. The questionnaire was pilot tested using 62 CEDs not included in the sample. No major changes were made to the questionnaire as a result of the pilot test. Using the data collected from the pilot test, a Cronbach's alpha reliability coefficient of .95 was obtained for the LPC scale. The reliabilities for the 12 leadership dimensions ranged from a low of .55 (representation) to a high of .78 (superior orientation).

CHART I
CONCEPTUAL DEFINITIONS FOR LEADER BEHAVIORS

1. Representation:	The leader acts and speaks as the representative of the group.
2. Demand Reconciliation:	The leader reconciles conflicting demands and reduces disorder disorder within the system.
3. Tolerance of Uncertainty:	The leader is able to tolerate uncertainty and postponement of things without being upset or becoming anxious.
4. Persuasiveness:	The leader uses persuasion and argument effectively while exhibiting strong convictions.
5. Initiation of Structure:	The leader clearly defines his or her own role and lets subordinates know what is expected of them.
6. Tolerance of Freedom:	The leader allows followers to initiate, decide, and act on items related to the organization.
7. Role Assumption:	The leader exercises the leadership role rather than surrendering the leadership role to others.
8. Consideration:	The leader regards the comfort, well-being, status, and contributions of subordinates.
9. Production Emphasis:	The leader encourages membership to increase production output.
10. Predictive Accuracy:	The leader exhibits foresight and ability to predict outcomes accurately.
11. Integration:	The leader maintains a close knit organization and is able to resolve inter-member conflicts.
12. Superior Orientation:	The leader maintains cordial relations with superiors, has influence with them, and is striving for higher status within the organization.

Source: Stogdill (1963). Manual for the leader behavior description questionnaire - Form XII: An experimental revision. Bureau of Business Research, The Ohio State University, Columbus, Ohio.

Data Collection and Analysis

Data were collected through a mail survey. After a initial mailing and two follow-ups, a total of 191 CEDs responded (62%). Early and late respondents were compared as suggested by Miller and Smith (1983). No significant differences were found between early and late respondents. Thus, the results were generalized to the population. Data were analyzed using frequencies, means, percentages, correlations, t-tests and ANOVA.

Findings

On an average, CEDs had 17 years of extension experience, with 9 years in the current position as CED. Seventy-seven percent of the CEDs reported the master's degree as their highest level of education, followed by baccalaureate degrees (20%), and doctorate degrees (3%). Sixty eight percent of the CEDs reported their major for the highest degree was in the social sciences, while 32% indicated their major for the highest degree was in the natural sciences. On an average, CEDs supervised three extension agents on staff, two secretaries and three paraprofessionals. The average number of administration courses taken by the CEDs was four.

Leadership Style, Behaviors and Practices

Sixty-two percent of the CEDs identified themselves as having a relation oriented leadership style, followed by task-oriented style (28%) and neither relation-oriented or task-oriented (10%) style (Table 1). This finding suggests that CEDs are primarily motivated by interpersonal relations and group support to accomplish personal and organizational goals. On the other hand, CEDs who identified themselves as task oriented, tend to be motivated by the accomplishment of tasks.

Table 1
Leadership Styles of County Extension Directors (n=191)

Leadership Style	Frequency	Percent
Relation-oriented style	119	62.0
Task-oriented style	53	28.0
Neither relation-oriented or task oriented	19	10.0
Total	191	100.0

The CEDs were asked to describe their self-perceived behaviors relative to 12 leadership dimensions (range 1-5). Results are shown in Table 2. The CEDs perceived that they "often" exhibited behaviors in the areas of tolerance of freedom (4.18), followed by consideration (4.00), representation (3.98), integration (3.87), predictive accuracy (3.87), initiating structure (3.83), superior orientation (3.73) and demand reconciliation (3.52). However, CEDs exhibited behaviors "occasionally" in the areas of tolerance of uncertainty (3.40), followed by role assumption (3.40), persuasiveness (3.38), and production emphasis (3.36).

Team Concepts

Regarding team concepts, a majority of the CEDs (70%) reported that team goals were "mostly clear" (Table 3). Presence of openness and trust (71%) and empathy (62%) existed in the team. In regard to meeting leadership needs, most CEDs (67%) indicated that leadership needs were attained through distribution of leadership functions that were creative and flexible. Team decisions were met through integrating the minority vote (18%) and full participation and consensus (55%). The team resources were well used and encouraged (77%), and members had some warm sense of loyalty and belonging to the team (75%).

Table 2
County Extension Director's Perception Scores for the Twelve Leadership Behavior and Practice Dimensions (n=191)

Leadership Dimension	Mean*	SD
Tolerance of freedom	4.19	0.38
Consideration	4.00	0.35
Representation	3.98	0.46
Integration	3.87	0.46
Initiating structure	3.80	0.35
Superior orientation	3.73	0.42
Predictive accuracy	3.67	0.34
Demand reconciliation	3.52	0.44
Tolerance of uncertainty	3.40	0.41
Role assumption	3.40	0.34
Persuasiveness	3.38	0.34
Production emphasis	3.36	0.41

*Mean computed on a scale that ranged from: 1=never; 2=seldom; 3=occasionally; 4=often; and 5=always.

Table 3
Frequencies, Percentages and Means for Team Concepts (n=191).

Team Concept and Response Option	f	%	Mean
How clear are the team goals?			
No apparent goals	4	2.1	
Goal confusion, uncertainty or conflict	6	3.1	
Average goal clarity	42	22.0	
Goals mostly clear	103	53.9	
Goals very clear	36	18.8	3.84
How much trust and openness is present in the team?			
Distrust and no openness	-	-	
Little trust, some openness	12	6.3	
Average trust and openness	43	22.5	
Considerable trust and openness	97	50.8	
Remarkable trust and openness	39	20.4	3.85
How empathetic are team members of each other?			
No empathy	1	0.5	
Little empathy	18	9.5	
Average empathy	52	27.5	
Considerable empathy	95	50.3	
Remarkable trust and empathy	23	12.2	3.64

Table 3
Continued

Team Concept and Response Option	f	%	Mean
How effective a balance exists between attention to the process of interpersonal relations and the task of the group?			
No attention to process or content	-	-	
Little attention to process or content	7	3.7	
Some concern with team process or content	38	20.0	
A fair balance between content and process	122	64.2	
Very concerned with process and content	23	12.1	3.85
How are team leadership needs met?			
Not met, drifting	-	-	
Leadership concentrated in one person	5	2.6	
Some leadership sharing	58	30.5	
Leadership functions distributed	86	45.3	
Leadership needs met creatively and flexibly	41	21.6	3.86
How are team decisions made?			
Unable to reach decisions	-		
Made by a few or by one person	11	5.8	
By majority vote	39	20.5	
Attempts at integrating minority vote	35	18.4	
Full participation and tested consensus	105	55.3	4.23
How well are team resources utilized?			
One or two contributed others silent	3	1.6	
Several tried to contribute but were discouraged	4	2.1	
Average use of team resources	37	19.5	
Team resources well used and encouraged	127	66.8	
Team resources fully and effectively used	19	10.0	3.82
To what extent do members have a feeling of loyalty and sense of belonging to the team?			
Members had no team loyalty or sense of belonging	1	.5	
Members not close but some friendly relations and loyalty	12	6.4	
About average sense of belonging and loyalty	34	18.1	
Some warm sense of belonging and loyalty	81	43.1	
Strong sense of belonging and loyalty among members	60	31.9	3.99

Relationships

Figure 1 shows the relationships between 12 leadership behavior and practice dimensions and team concept. Significant, low to substantial relationships were found between team concept values and leadership behavior and practice dimensions: predictive accuracy (r=.19), production emphasis (r=.24), tolerance of uncertainty (r=.26), role assumption (r=.30), initiating structure (r=.34), persuasiveness (r=.38), tolerance of freedom (r=.38), superior orientation (r=.38), demand reconciliation (r=.39), consideration (r=.42), and integration (r=.60).

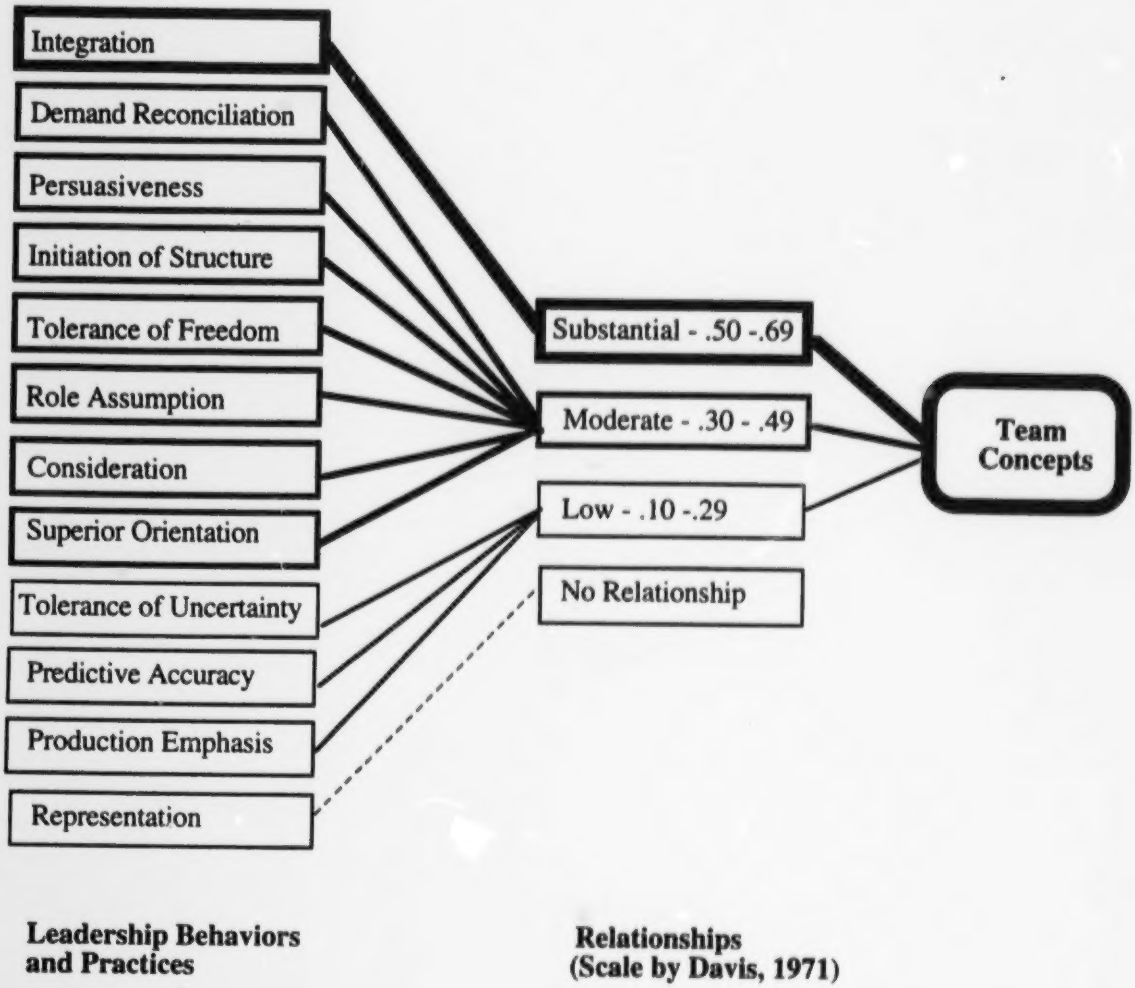

Integration
Demand Reconciliation
Persuasiveness
Initiation of Structure
Tolerance of Freedom
Role Assumption
Consideration
Superior Orientation
Tolerance of Uncertainty
Predictive Accuracy
Production Emphasis
Representation
Substantial - .50 -.69
Moderate - .30 - .49
Low - .10 -.29
No Relationship
Team Concepts
Leadership Behaviors and Practices
Relationships (Scale by Davis, 1971)

Figure 1
Relationships Between 12 Leadership Dimensions and Team Concept

Significant relationships were found between leadership behaviors and practices and the number of extension agents on staff supervised and the number of administration courses taken by CEDs. No significant relationships were found between other variables (total years in extension service, years of experience as CED, title before becoming CED, number of secretarial and paraprofessionals supervised, education level and major for the highest degree) and leadership behaviors and practices. This finding closely mirrors the earlier findings of Cobb (1989) for North Carolina CEDs.

Conclusions and Recommendations

This study provides basic insights regarding CEDs' leadership behaviors and practices. The findings have implications for professional development programming for CEDs.

Clearly, the findings indicate that CEDs, in general, possess the requisite skills needed for the CED leadership role. The self-perceived description of leadership behaviors and practices of CEDs may be utilized to identify strengths and weaknesses of CEDs in the leadership role. Such identification would help determine additional training to maximize leader behaviors and practices, especially in the areas where CEDs exhibited lower levels of leader behaviors.

The concept of working as a team should be encouraged and strengthened. Findings suggest that leadership behaviors and practices of CEDs is associated with team work exhibited by the county extension staff. CEDs who exhibited higher levels of team work were viewed as having higher leader behaviors. Further, inservice education relative to team building and working as a team must be offered. Such inservice should emphasize building a team, importance of working as a team, and how team work may enhance extension program and organizational effectiveness.

Number of agents on staff and number of administration courses completed by CEDs were related to leadership behaviors and practices exhibited by CEDs. Those CEDs who supervised three or more extension agents on staff exhibited higher level of leaders behaviors than those CEDs who supervised less than three extension agents on staff. CEDs who had taken four or more administration courses (extension administration, organizational development, public administration, sociology, etc.) exhibited higher levels of leader behaviors than those CEDs who had completed fewer than four administration courses.

Historically most CEDs were agricultural agents. The findings suggest the level of CED leadership effectiveness is the same regardless of the program area (4-H, home economics, and community development) of the individual prior to becoming a CED. Therefore, it is recommended that all individuals should be considered for the CED position regardless of the program area they previously worked. Staff development personnel in extension systems need to identify specific staff development activities which facilitate CEDs team building in relation to the 12 leadership behaviors and practice dimensions.

References

Cobb, D. W. (1989). Leadership effectiveness of county extension directors: A comparison of perceptions between county extension agents and county extension directors within the North Carolina Extension Service. Unpublished doctoral dissertation. Raleigh: North Carolina State University.

Distasio, A. W. (1985). Time management, leadership styles, and selected demographic factors of Connecticut school superintendents. Unpublished doctoral dissertation. Storrs: University of Connecticut.

Fiedler, F. E., Chemers, M. M., & Mahar, L. (1976). Improving leadership effectiveness: The leader match concept. New York: Wiley.

Holder, S., Denk, J., & Rodriguez, R. (1992). Leadership style and leadership behavior preferences of Cooperative extension faculty. Proceedings of the Symposium for Research in Agricultural and Extension Education. Columbus: The Ohio State University.

Kouzes, J. M. & Posner, B. Z. (1988). The leadership challenge. San Francisco: Jossey Bass.

Stogdill, R. M. (1963). Manual for the leader behavior description questionnaire--Form XII: An experimental revision. Bureau of Business Research, Columbus: The Ohio State University.

SELF-PERCEIVED LEADERSHIP BEHAVIORS AND PRACTICES OF COUNTY EXTENSION DIRECTORS: A NATIONAL PERSPECTIVE

A Critique

Arlen W. Etling, The Pennsylvania State University--Discussant

This study, which examined the self-reported leadership styles, behaviors, and practices of County Extension Directors, provides a national perspective of Cooperative Extension middle management. It focused on the CEDs' own perceptions of their leadership styles and behaviors citing two state studies which found no difference between CEDs' perceptions of their leadership and the extension agents' (supervised by the CEDs) perceptions. No evidence was cited, however, to show that Cooperative Extension Directors or Regional Directors agreed with those perceptions. This delimitation means that results, conclusions, and recommendations must be kept within the context of the respondents' perceptions.

The authors apparently overlooked this delimitation. Some conclusions were based on assumed behaviors rather than the respondents' perceptions of those behaviors. This problem was not a major one and the study still makes a strong contribution to our understanding of the leadership of CEDs.

The comparison of self-reported leadership behaviors with the CEDs perceptions of teamwork among agents in their counties was particularly interesting. At this point the chart attached at the end was essential to understand definitions of leadership behaviors. Logically integration would have a substantial relationship with team concept. Likewise representation, production emphasis, and predictive accuracy would have a low relationship with team concept. Why, however, would tolerance of uncertainty have a lower relationship with team concept than persuasiveness, initiation of structure, or role assumption? Why would superior orientation have a higher relationship with team concept than tolerance of uncertainty or production emphasis?

Is group maturity a variable which is important to the findings in this study? Is it important to the relationships between leadership behaviors and team concept? Group maturity can be defined as "the ability and willingness of group members to set group goals and work toward their accomplishment."

The findings suggest, as the authors maintain, topics for staff development. More study is needed, however, in order to set priorities for staff development activities. Staff development relates to organizational needs as much or more than the perceived needs of individuals within the organization.

Still this is an interesting study. The findings are worth further discussion. The recommendations are worth the attention of state administrators.

A STUDY OF THE ADOPTION AND NON-ADOPTION OF APPROVED PRACTICES BY MINNESOTA DAIRY FARM OPERATORS

Earl W. Bracewell, Project Director
Edgar A. Persons, Professor & Head
Abderrazak Lakjaa, Research Assistant
Chunju Chen, Statistical Consultant
Division of Agricultural Education
University of Minnesota

Introduction

The United States Cooperative Extension Service (CES) has a long and well understood history of extending and diffusing new and innovative practices developed at universities, to both adults and youths. The practices and innovations of the past two or three decades that have been adopted by America's farmers have been, to a large extent, promoted by CES educational programs. Theories about how people adopt new practices and how new practices proliferate form the foundation for extension program organization and implementation (Baumgartel, 1983; Brown, 1981; Burt, 1973; Chambers, Pacey & Thrupp, 1989; Rogers, 1983; Solo & Rogers, 1972). Supporting the premises of innovation diffusion and CES programming is a large body of literature (Blackburn, 1984, Blackburn, 1989; Rogers & Burdge, 1972; Stevens & Jabara, 1988). In spite of the breadth of the literature dealing with the innovation adoption process, surprisingly little deals with theories of why people do not adopt practices. Non-adoption or late adoption is characteristic of one-half the population exposed to innovation. Why does it occur?

The dairy industry in Minnesota is a segment of agriculture that has experienced recent introduction of a large number of innovative practices. While many of those innovations have been widely accepted, others have not been adopted at the same rate. Too, there is a sense that the adoption of a specific innovation by dairy farm owners/operators is not predictable. The orderly process of dissemination from one group to another in the adoption schema appears to have gone awry. This is true both by the nature of the innovation and by the past adoptive practices of the dairy farm owner/operator.

Purpose

The basic purpose of this study was to determine, 1) why some Minnesota dairy farm owners/operators adopted some approved practices and did not adopt others, 2) what were the characteristics of practices that were adopted as compared to those that were not, 3) what were the characteristics of decision makers in the adoption (non-adoption) process, and 4) what were the characteristics of Minnesota dairy farms. Determining why some approved dairy farm practices were adopted while others were not may make it possible to modify the message (or the messenger) of the Minnesota Extension Service (MES), thus improving the benefit-cost ratio of educational programs while at the same time stimulating the economic rewards to Minnesota's dairy farm owners/operators.

Methods

The major method to examine the questions related to the adoption/non-adoption of Minnesota's dairy farm practices was a survey instrument developed for this study. The survey was distributed to a random sample of 614 of Minnesota's more than 15,000 dairy farm owners/operators.

Prior to its distribution and to establish instrument validity, focus group interviews were conducted with dairy farmers in three disparate locations. Content validity was established by experts from the University of Minnesota Experiment Station and MES faculty.

The survey instrument consisted of three major parts. From a list of possible sources of information, Part I of the survey asked respondents to rank the frequency and trustworthiness s/he placed in information received. From a list of approved practices developed by University of Minnesota Experiment Station and MES faculty, Part II of the survey instrument asked the respondent to: (a) reconstruct the decision-making process leading to the adoption and continuation of a newly adopted approved practice; (b) reconstruct the decision making process leading to the decision to adopt an approved practice within the next five years; (c) reconstruct the decision making process leading to the adoption and subsequent discontinuation of an approved practice; and, (d) reconstruct the decision making process leading to the decision not to adopt an approved practice. From the practices respondents selected, each was asked to rate the practices on attributes of: 1) compatibility with existing values, past experience and needs; 2) complexity; 3) observability; 4) relative advantage; and, 5) trialability. Part III of the survey consisted of farm and respondent variables that may influence the adoption/non-adoption process.

Findings

From the original sample of 614, 441 questionnaires were returned for a total return rate of 71.8%. A frame error estimate of 22 was established based on responses from the returned questionnaires, thus creating a usable sample of 592. Data were analyzed from the accepting sample of 379, a calculated return rate of 64.0% of usable sample.

Table 1
Population, Sample, and Frame Error Estimates

Population, Sample, and Frame Error Estimate	Number
Original population	15000±
Original sample	614
Less: Frame error estimate	22
Usable sample	592
Less: Those who refused to cooperate	39
Less: Non-respondents	174
Accepting sample	379

T-tests were used to analyze differences between variables. Spearman Rho correlation coefficients were calculated for frequency and trust rankings. To determine internal consistency, Cronbach's alpha was calculated for the sources of information. Alpha was calculated at .80 for the frequency of information received, .82 for the trust level. Reliability of the instrument was examined by administering Part I and Part II the survey instrument to a sample of 40 respondents two weeks after receiving completed questionnaire. However, because of the Spring season, only 14 were completed and returned, therefore no measure of reliability for those portions is reported. No measure of reliability was attempted for the demographic section of the questionnaire since there was no reason to believe a question of reliability existed for that data.

From a list of 14 possible information sources, for changes in dairy farm practices, farmers indicated they more frequently use information from Veterinarians than from any other single source. Agricultural Suppliers were also indicated as a source of frequently used information.

County Extension Agent and University Extension Specialist ranked seventh and eighth respectively. From the same list, Veterinarians and Family Members were indicated as the most trustworthy sources of information used by farmers to make practice changes. For trustworthiness, County Extension Agent and University Extension Specialist ranked fifth and sixth.

Spearman Rho Coefficient Correlation between the frequency and the trustworthiness of information sources was calculated at .84.

Table 2
Frequency and Trust Levels of Information Sources Used to Make Changes in Dairy Farm Practices of Respondents

	Mean Response*		Mean Response**	
Information Source	Frequency (N=370)	Rank***	Trust (N=370)	Rank***
Veterinarian	3.31	1	3.50	1
Agricultural Supplier	3.11	2	2.89	3
Family Members	2.88	3	3.16	2
Neighbor or Friend	2.62	4	2.74	4
Advertising Circular, Label, etc.	2.46	5	2.12	12
Mass Media	2.41	6	2.22	8
County Extension Agent	2.23	7	2.72	5
University Extension Specialist	2.06	8	2.61	6
Banker or Lender	1.88	9	2.20	9
Farm Business Mgt. Instructor	1.78	10	2.23	7
Professional Ag Literature	1.73	11	2.14	10
Paid Agriculture Consultant	1.66	12	2.14	11
High School/Tech College Ag Teacher	1.62	13	2.01	13
Electronic Information Service	1.38	14	1.60	14
Mean	2.22		2.45	

Descriptors

* 1 = Little Never
2 = Some Seldom
3 = Much Often
4 = Almost Always
5 = Always

** 1 = Little
2 = Some
3 = Much
4 = Very Much
5 = An Exceptional Amount

***Spearman Rho Coefficient Correlation = .84

Respondents perceive the characteristics of practices adopted differently from the characteristics of those practices that they do not plan to adopt. At the .05 level of significance, the characteristics of practices adopted to those that farmers do not plan to adopt have the following relationships: 1) more compatible with existing values, past experiences and needs; 2) more simple; 3) somewhat more observable; 4) better than the practices they replaced; and 5) easy to try on a limited scale.

Table 3
Perceptions of Characteristics of New or Innovative Dairy Practices of Dairy Initiative Respondents

Practice Characteristic	Do Not Plan to Adopt (N=363) Mean	S.D.	Have Adopted (N=352) Mean	S.D.
Compatibility:				
w/existing values (A)	1.73	1.04	3.85	0.55*
w/past experiences (A)	1.74	1.05	3.75	0.62*
w/needs (A)	1.85	1.08	3.83	0.57*
Complexity (B)	2.22	1.17	1.61	0.92*
Observability (C)	2.69	1.18	3.37	0.90*
Relative Advantage (D)	2.56	1.17	3.84	0.43*
Trialability (E)	3.14	1.03	1.59	0.90*

Descriptors:
(A) 1 = Incompatible, 4 = Compatible
(B) 1 = Simple, 4 = Complex
(C) 1 = Non-observable, 4 = Observable
(D) 1 = Worse, 4 = Better
(E) 1 = Easy, 4 = Difficult

* Significant at .05 level

The following relationships were found as respondents were asked to reconstruct the sources first and secondary knowledge, and most compelling reason to adopt and to not adopt specific practices:

1. Mass Media was found to be the most important source of first knowledge both for practices that have been adopted as well as for practices that farmers do not plan to adopt.

2. Self (little or no recognizable or identifiable outside source) was found to be the most important source of secondary knowledge both for practices adopted and for practices that farmers do not plan to adopt.

3. Economics and Time were found to be the two most compelling reasons for not adopting a specific practice. Herd Health and Economics were the two most compelling reasons given for adopting specific practices.

The average respondent was: male, 44.6 years of age, had completed 12.3 years of education, described himself as the farm "Operator," and had been a decision maker for 21.3 years.

The average farm was organized as a sole proprietorship, it has nearly equal probability of having either one or more than one household units working on it. It has 52.1 cows. Additionally, the farm was somewhat more likely to have had 1991 net earnings less than $20,000 than it was to have net earnings more than $20,000. Too, the farm was specialized, earning most of its net income from the dairy enterprise.

The distribution of adopted practices from the list of 24 approved practices indicated that the adoption of those practices approximated a normal distribution with a mean of 11.4 and a standard deviation of 4.7. Because the sample distribution approximated a normal distribution, respondents were assigned by their level of adoption to one of three adoption groups. The Low Level Adopter Group included those who had adopted six or less practices, the Moderate Level Adopter Group included those who had adopted between seven and 16 practices, and the High Level Adopter Group included those who had adopted 17 to 24 practices.

Comparison and Contrasts of Low and High Level Adopters

Source and Frequency. From the list of 14 possible sources of information, Low Level Adopters obtained information less frequently than did High Level Adopters. Both Low and High Level Adopters appraised Veterinarian as the most frequently used source of information to make changes in dairy farm practices. Low Level Adopters ranked County Extension Agent and University Extension Specialist seventh and ninth respectively as the most frequently used sources of information. High Level Adopters ranked County Extension Agent and University Extension Specialist higher than Low Level Adopters, at sixth and fifth, respectively. For frequency of information obtained, there was a .79 correlation between the Low Level and High Level Adopter groups as measured by Spearman Rho Correlation Coefficient.

Table 4
Frequency Levels of Information Sources Used to Make Changes in Dairy Farm Practices of Low and High Level Adopters

	Low		High	
Source	Mean Response* (N=61)	Rank**	Mean Response* (N=58)	Rank**
Veterinarian	3.05	1	3.59	1
Family Member	3.00	2	3.09	3
Agricultural Supplier	2.85	3	3.26	2
Mass Media	2.83	4	2.60	7
Neighbor/Friend	2.57	5	2.72	4
Advertising Circular, Label, etc.	2.43	6	2.57	8
County Extension Agent	2.15	7	2.71	6
Banker or Lender	1.83	8	2.04	12
University Extension Specialist	1.67	9	2.72	5
Professional Agric Literature	1.48	10	1.98	13
Electronic Information Service	1.39	11	1.61	14
Farm Business Mgt. Instructor	1.38	12	2.42	9
High School/Tech College Ag. Teacher	1.35	13	2.18	11
Paid Agric Consultant	1.26	14	2.31	10
Mean	2.09		2.82	

Descriptors:
* 1 = Never
2 = Seldom
3 = Often
4 = Almost Always
5 = Always

** Spearman Rho Correlation Coefficient Low Level Adopters: High Level Adopters = .79

Practice Characteristics. Low Level and High Level Adopters perceive the characteristics of practices similarly. Both Low Level and High Level Adopter groups perceive the characteristics of compatibility, complexity, observability, relative advantage, and trialability to be higher for practices they have adopted than for practices they do not plan to adopt.

Table 5

Perceptions of Characteristics of New or Innovative Dairy Practices of Low and High Level Adopters

Characteristic	Do Not Plan to Adopt		Have Adopted	
	Low (N=46)	High (N=46)	Low (N=51)	High (N=51)
Compatibility:				
w/existing values (A)	1.50	1.50	3.67	3.89
w/past experiences (A)	1.56	1.40	3.57	3.76
w/needs (A)	1.46	1.80	3.70	3.87
Complexity (B)	2.23	1.92	1.52	1.76
Observability (C)	2.35	3.13*	3.24	3.53
Relative Advantage (D)	3.26	2.54	3.71	3.86
Trialability (E)	3.14	3.31	1.63	1.86

Descriptors

(A) 1 = Incompatible, 4 = Compatible

(B) 1 = Simple, 4 = Complex

(C) 1 = Non-observable, 4 = Observable

(D) 1 = Worse, 4 = Better

(E) 1 = Easy, 4 = Difficult

* Significant at .05 level (for informational purpose only since this relationship should be interpreted as *in situ* due to the manipulation of the variable, "Practices Adopted" that was used to test the hypothesis of the normal, bell-shaped curve).

First Knowledge Source. Mass Media was found to be the most important source of first knowledge for practices that both Low Level and High Level Adopters do not plan to adopt. Self was the most important source of first knowledge for Low Level Adopters for practices that they have adopted. Mass Media was the most important source of first knowledge for High Level Adopters for practices that they have adopted.

Secondary Knowledge Source. Self was the most important source of secondary knowledge for practices that Low Level Adopters do not plan to adopt as well as for practices that they have adopted. Self was the most important source of secondary knowledge for practices that High Level Adopters do not plan to adopt. Mass Media and Neighbor or Friend was the most important source of secondary knowledge for practices that High Level Adopters have adopted.

Most Compelling Reason. Economics and Time were the two most compelling reasons, both by Low Level and High Level Adopters, for not adopting a specific practice. Herd Health was the most compelling reason Low Level Adopters adopted a specific practice. Economics was the most compelling reason High Level Adopters adopted a specific practice.

Farmer Characteristics. The average Low Level Adopter farmer was: male, 50.6 years of age, had completed 11.0 years of education, described himself as the farm "Operator," and had been a decision maker for 28.1 years.

The average High Level Adopter farmer was: male, 41.2 years of age, had completed 12.9 years of education, described himself as the farm "Operator," and had been a decision maker for 18.6 years.

Farm Characteristics. The average Low Level Adopter farm was organized as a sole proprietorship, it had nearly equal probability of having either one or more than one household units working on it. It has 38.2 cows. The farm has a greater likelihood of having 1991 net earnings less than $20,000 than it does having net earnings greater than $20,000. The farm was specialized, earning most of its net income from the dairy enterprise.

The average High Level Adopter farm was organized as a sole proprietorship, it has greater probability of having more than one household units working on it. It has 81.5 cows. Its 1991 net earnings are likely to be in excess of $20,000, and most likely to be in excess of $50,000. The farm was specialized, earning most of its net income from the dairy enterprise.

Implications

Based on the study results:

1. MES should place greater emphasis in educational programs for individuals and groups such as veterinarians and agricultural suppliers who were identified by dairy farmers as frequently used as well as trustworthy sources of information.

2. MES needs to recognize the importance economics plays in the adoption and non-adoption of dairy farm practices. Messages must be developed to provide economic data relevant to the innovation or practice so farmers can make informed choices.

3. MES must continually strive to utilize mass media as a means of informing Minnesota dairy farmers about new and possibly advantageous dairy practices.

4. MES educators could benefit from instruction about the decision-making process that Minnesota dairy farmers use in the adoption and non-adoption of dairy practices.

5. Further research needs to be conducted to determine whether changes in the message or the messengers of MES would enhance the adoption process of dairy practices.

6. Further research needs to be conducted to determine specific characteristics of practices or about specific characteristics of farmers that hinders or assists the adoption of dairy practices.

7. Further research needs to be conducted to determine why some information sources are more frequently used and are perceived to be more trustworthy than others.

8. Further research needs to be conducted to determine the relative importance of identifiable practice characteristics and to develop a practice adoption probability model.

References Cited

Baumgartel, H. (1983). Human factors, technology diffusion, and national development. The Journal of Applied Behavioral Science, 19(3), 337-348.

Blackburn, D. (1984). Extension handbook. Guelph, Ontario: University of Guelph.

Blackburn, D. J. (Ed.). (1989). Foundations and changing practices in extension. Guelph, Ontario: University of Guelph.

Brown, L. A. (1981). Innovation diffusion. New York: Methuen.

Burt, R. S. (1973). The differential impact of social integration on participation in the diffusion of innovations. Social Science Research, 2, 125-144.

Chambers, R., Pacey, A., & Thrupp, L. D. (1989). Farmer first: Farmer innovation and agricultural research. London: Intermediate Technology Publications.

Courtney, S. (1991). Ways of doing: Motivation personal change and the diffusion of knowledge.

Rogers, E. & Burdge, R. (1972). Social change in rural societies (2nd ed.). New York: Meredith.

Rogers, E. M. (1983). Diffusion of innovation (3rd ed.). New York: The Free Press.

Solo, R. & Rogers, E. (1972). Inducing technological change for economic growth and development. East Lansing: Michigan State University Press.

Stevens, R. D. & Jabara, C. L. (1988). Agricultural development theory. Agricultural development principles: Economic theory and empirical evidence. Baltimore: Johns Hopkins University Press.

A STUDY OF THE ADOPTION AND NON-ADOPTION OF APPROVED PRACTICES BY MINNESOTA DAIRY FARM OPERATORS

A Critique

Arlen W. Etling, The Pennsylvania State University--Discussant

This study was undertaken to determine why the target population adopts certain practices and does not adopt others. Building on previous studies on adoption theory, including Rogers' the authors emphasized reasons for non-adoption in their introduction. This study had a clear and compelling theoretical base.

The objectives were clearly stated and the methods were succinctly described. Data were collected from respondents by asking them to "reconstruct" their decision making processes when they adopted or decided not to adopt certain practices. Some more explanation in the methods section would have been helpful. Have these procedures been used before? To what degree are they valid and reliable? What procedures can help insure that the respondents' "reconstructions" are accurate?

In describing stages of adoption the authors used the terms "first knowledge" and "secondary knowledge." What, precisely, do those terms mean? Do they coincide with the classical descriptors of the stages of adoption (awareness, interest, evaluation, trial, adoption). Likewise do "low level adopter group, moderate level adopter group," and "high level adopter group" correspond to "innovators, early adopters, early majority, late majority," and "laggards?" Why were these terms chosen rather than the more familiar terms? Their use raises questions and doubts.

The findings indicate that veterinarians, agricultural suppliers, family members, neighbors, and mass media are all trusted more, as sources of information used to make changes in dairy farm practices, than county extension agents, university extension specialists, or teachers of agriculture in schools. Should agricultural educators be alarmed at these findings? How does this ranking compare with rankings in previous studies? Are agricultural educators losing the trust of dairy farmers? If so, why?

The conclusions and implications appear to be appropriate and to be supported by the findings. Low level and high level adopters emphasize the same characteristics when deciding to adopt or not adopt. Compatibility, complexity, observability, relative advantage, and trialability are all key factors in adoption. Economics is a key reason for adoption or non-adoption. Recommendations for Minnesota Extension Educators are presented.

The objectives of the study were met. The study contributes to our understanding of adoption theory. A broader study would have contributed more. Additional research is needed before we revise classical adoption theory.

A COMPARISON OF INFORMATION SOURCES USED BY FARMERS WHO ENROLLED AND THOSE WHO DID NOT ENROLL IN SELECTED FARM BUSINESS MANAGEMENT PROGRAMS IN MINNESOTA

Dr. Larry J. Klingbeil
Assistant Professor
Department of Agricultural Sciences
East Texas State University

Dr. Edgar Persons, Professor
Chunju Chen, Research Assistant
Agricultural Education Division
University of Minnesota

Introduction

Intelligent decisions are usually based upon accurate information. Historically, farmers have utilized available non-formal resources to increase their knowledge so they can raise their crops or livestock in a more efficient and profitable manner (Baker, 1954; Hodgkins, 1957).

As information sources became more sophisticated so did the farmers. There were movements among farmers where they banded together in local farmer groups or clubs for education and social purposes (Persons, 1982; Buckridge, 1990). From this movement developed corn and cotton clubs, the Lyceum and Chautauqua movements. Through these non-formal resources, farmers where able to expand their knowledge and be exposed to new farming practices and principles to adopt in their own operation.

New practices, however, improved agricultural production only when they were adopted by farm operators. Rogers (1983) defined adoption as "the decision to make full use of an innovation as the best course of action available" (p. 21). Gallatin (1989) suggested the adoption process for innovations was the mental process an individual goes through from hearing about the process until adoption. The adoption of innovations is considered to represent a process rather than an instantaneous event.

The process of adoption has been the subject of many investigations. Following up on earlier work by Rogers, Gubbels and Coolie (1967) in their study of Canadian farmers renamed Rogers five adoption stages to the more commonly accepted: 1) awareness, 2) interest, 3) evaluation, 4) trial, and 5) adoption stages. The interest stage brings about a collection of information and thought from various sources. This information is evaluated to see if the information can fulfill a need.

As technology developed, farmers sought and used new information sources (Richardson, 1988). These sources provided more timely information from more sophisticated decision making data than exchanges between their neighbors or relatives (Coughenour, 1959, 1962). The advent of radio and television brought the world to the rural living rooms. Telecommunications systems have been developed that brought market information instantaneously to the farmer via a computer modem or satellite dish.

One of the challenges of working with adult farmers is to provide accurate and up-to-date information to answer their agricultural questions. It is important to know where farmers go to get their questions answered and what sources are preferred for different types of questions. It is also important to find out if farmers who are enrolled in a Farm Business Management (FBM) Educational Program have a different preference for information sources than those who are not enrolled.

Purpose

The purpose of this study was to determine the information sources farmers used and their expressed order of preference of these sources for agriculturally related technical knowledge. The study also sought to describe the relationship between enrollment and non-enrollment in a FBM Education program and farmer preferences of information sources. The study was guided by the following research questions:

1. What agricultural information sources do farmers use to answer technical questions related to:

   a. agronomic problems
   b. livestock issues
   c. equipment and mechanical concerns
   d. financial decisions
   e. management functions
   f. personal concerns

2. What is the farmers' order of preference for agricultural information sources to answer agriculture related questions?

Procedures

Population and Sample

Two populations were investigated in this study. The first population consisted of approximately 5800 farm families who were enrolled statewide in the Minnesota Farm Business Management program in 1991. The sample of 300 farmers from this population were randomly selected from 19 FBM programs located in a 12 county area in south central Minnesota. The only criteria for selection from among the enrolled population was that they had to have completed one full year as an FBM enrollee.

The second population included all persons in Minnesota who, by their own assessment, would be classified as farmers and were not members of a FBM program. The second sample of 800 persons were selected by a random process from rural residences in the same 12 counties from which the FBM sample was drawn. While 496 rural residents returned the questionnaire only 195 were, by their own assessment, classified as farmers and were not members of a FBM program.

The sample of farmers enrolled in the FBM program was selected from the lists of enrollees provided by FBM instructors. The other sample of non-enrolled farmers was drawn using the most current edition of county plat books (Farm & Home Publishers, 1989, 1990).

Questionnaire Development

The questionnaire was developed by the researcher and was based on 42 different categories of farm business procedures needed to carry out a successful farm operation (Warner, Bracewell, Klingbeil, & Migler, 1990). Based on the literature, (Ford & Babb, 1989) it was determined there were 15 major information sources used by farmers. To determine the content and face validity of the questionnaire, the focus group interview process was utilized. Ten farmers who were enrolled in a local Farm Business Management education program evaluated the questionnaire and the accompanying cover letter using a focus group process that lasted one hour. Based on their recorded answers, the questionnaire was revised. Also a modified Delphi Technique was used, following the focus group, with an expert panel of judges to refine the questionnaire.

The questionnaire was pilot tested with 21 Farm Business Management students in a geographic area not included in the study area, using the test-retest procedure. A perfect test-retest comparison would have yielded a test/retest score of 3.0. The weighted average determined by this process was 2.21. This meant that, on the average, respondents chose more than two out of the three information sources they selected during the first administration of the questionnaire. Two weeks elapsed between the first and second administration of the same questionnaire.

Data Collection

Survey construction and data collection followed the methods outlined by Dillman (1978) to increase the response rate. Each non-enrolled and enrolled farmer was mailed a questionnaire containing a cover letter asking for their cooperation and an envelope for returning the completed forms. One reminder postcard and a second follow-up letter with another questionnaire enclosed were sent to the non-respondents. There was a gross return of 62% (496) from the general non-enrolled sample. Of those returned, 195 were farming and were useable for the survey. This figure made a useable return rate of 39.1% for this population. The enrolled farmers had 223 useable returns for a 69.7% return. Tests for the similarity of respondents and non-respondents were made by comparing the demographics and farm data of the respondents with the data from the last agricultural census in the respective counties. There were no major differences of consequence between the sample and the census information.

Data Analysis

Percentages, frequencies and weighted averages were determined for the data contained in the demographic information of the questionnaire. The analysis was based on their status of being enrolled or not being enrolled in a FBM Education Program and their preferences of information sources for specific farm business questions.

Findings

Demographic Information

The demographic data provided by the farmers showed some similarities and some major differences between those enrolled in FBM programs and those not enrolled. The major differences between the two groups were as follows:

- The enrolled farmers were 10 years younger (39.8 vs. 50.5).
- Enrolled farmers farmed 27.6% more acres (448.8 vs. 351.8).
- Enrolled farmers had average gross farm sales between $100,000-$199,999 as compared to average gross farm sales of non-enrolled farmers of $50,000-$99,999.
- The enrolled farmers received a higher percentage of their gross farm sales from livestock, whereas the non-enrolled farmers received theirs from crops.
- The enrolled farmer generally had a higher level of education. Sixty-five percent of the enrolled farmers reported some type of post high education with almost 20% receiving a post-high school degree. This compares with 32.6% of the non-enrolled farmers who reported some post-high school education and 12% with a post-high school degree.
- The enrolled farmers chose technical agriculture programs in agricultural production, animal science, and agronomy for 48.6% of the post-high school education compared to 36.5% for the non-enrolled. Twice as many enrolled farmers had chosen agricultural

economics and farm management post-high school education, (11.1% vs. 5.3%) as the non-enrolled farmer group.

* The enrolled farmer had farmed 18.1 years compared to 27.5 years for the non-enrolled farmer.

* The enrolled respondent had been enrolled in a FBM program for an average of 8.6 years with a range of 1 to 32 years.

Choice of Information Choices

There were nine categories of questions that were summarized with a weighted score for the choice of information preferred by enrolled and non-enrolled farmers. The nine different categories of questions and procedures included: crop planning, crop growing season, crop post harvest and evaluation procedures, livestock, business planning procedures, business methods procedures, marketing and government programs, personal farm business procedures, and equipment and farmstead concerns (Table 1).

1. Noted differences between non-enrolled and the enrolled farmers were most prevalent in the business planning and methods categories. These two categories included developing family/ business goals, cash flows, record keeping systems, financial analysis, income tax planning, and business agreements. The non-enrolled farmer chose the banker first, the FBM instructor second, and the county agent as the third choice for an information source on these concerns. The enrolled farmer chose the FBM instructor first, the banker second, and the county agent third. The inclusion of the FBM instructor as a second place choice by a farmer that is not even enrolled in a FBM program may indicate the FBM instructor may be recognized as a community expert in business methods and planning.

2. When all information needs were considered as a group, the top five overall preferred information choices for the non-enrolled farmers were commercial personnel (18.3%), the county agent (15.1%), neighbors, friends and relatives (8.4%), the banker (7%), and paid consultants (6.1%). These five choices accounted for 54.9% of the total choices.

3. The enrolled farmers chose the FBM instructor (23.1%), commercial sources (16.5%), the county agent (14%), the banker (6.9%), and neighbors, friends and relatives (6.3%) for their top five choices. These five sources comprised 66.8% of the total choices.

4. Non-enrolled farmers listed the FBM instructor as their 8th choice of information, even though the FBM instructor is generally not considered to be accessible to those not enrolled. In some categories of problems, FBM instructors were considered, even by the non-enrolled framers, to be primary sources of information (business planning procedures and business methods).

5. Enrolled farmers made less use of neighbors, friends and relatives as a source of information than did non-enrolled farmers.

Conclusions

1. FBM instructors are a respected information source in the community, especially concerning business methods and planning. Business methods and planning included developing family/business goals, farm budgets and cash flows, farm record keeping, financial analysis, income tax planning, and business agreements.

2. The FBM instructor takes the place of the county agent and paid consultants and becomes a major information source for enrolled farmers.

Table 1

Overall Preferred Information Choice for Non-Enrolled or Enrolled Farmers Concerns.

Information Source	NON-ENROLLED							ENROLLED						
	1st Choice	2nd Choice	3rd Choice	Total 1,2,3	% of Responses	Weighted Responses	*Rank	1st Choice	2nd Choice	3rd Choice	Total 1,2,3	% of Responses	Weighted Responses	*Rank
1. Commercial	1569	731	642	2942	18.3%	12.69	1	1803	1187	771	3761	16.5%	11.25	2
2. Co. Agent	696	854	875	2425	15.1%	8.70	2	497	1437	1259	3193	14.0%	7.40	3
3. Neighbors	354	468	535	1357	8.4%	4.72	3	368	467	606	1441	6.3%	3.48	5
4. Banker	515	363	249	1127	7.0%	4.70	4	159	818	594	1571	6.9%	3.56	4
5. Consultants	416	319	250	985	6.1%	3.98	5	450	364	365	1179	5.2%	3.21	6
6. Self	682	122	112	916	5.7%	4.48	6	342	83	139	564	2.5%	1.75	11
7. Magazines,etc.	226	488	491	1205	7.5%	4.00	7	170	373	547	1090	4.8%	2.37	8
8. FBM	303	261	492	1056	6.6%	3.58	8	3328	1220	728	5276	23.1%	17.30	1
9. U Bulletins	184	336	495	1015	6.3%	3.20	9	224	412	614	1250	5.5%	2.78	7
10. Written	194	258	379	831	5.2%	2.75	10	197	293	382	872	3.8%	2.05	10
11. U Specialist	152	264	479	895	5.6%	2.73	11	156	409	462	1027	4.5%	2.30	9
12. ASCS, SCS	201	105	88	394	2.4%	1.68	12	150	136	140	426	1.9%	1.13	13
13. Veterinarian	141	93	57	291	1.8%	1.24	13	191	99	96	386	1.7%	1.14	12
14. Electronic	79	98	82	259	1.6%	0.96	14	52	114	106	272	1.2%	0.64	14
15. Tax Account	117	19	6	142	0.9%	0.74	15	40	54	30	124	0.5%	0.34	16
16. H.S. Vo-Ag	24	70	79	173	1.1%	0.54	16	23	83	92	198	0.9%	0.43	15
17. Lawyer	44	5	2	51	0.3%	0.27	17	32	20	32	84	0.4%	0.22	17
18. Clergy	5	3	4	12	0.1%	0.05	18	15	4	4	23	0.1%	0.07	18
19. Classes	4	2		6	0.0%	0.03	19	11	6	3	20	0.1%	0.06	19
20. Doctor	4	1	1	6	0.0%	0.03	19	10	7	1	18	0.1%	0.06	19
21. Other Consult	4			4	0.0%	0.02	21	7	2	1	10	0.0%	0.03	22
22. Mechanic	2	1		3	0.0%	0.01	22				0	0.0%	0.00	
23. Marketing Club	1	1	1	3	0.0%	0.01	22	2	2		4	0.0%	0.01	24
24. Broker				0	0.0%	0.00		7	6	2	15	0.1%	0.05	21
25. Reference Book				0	0.0%	0.00		3	1	1	5	0.0%	0.02	23
TOTALS	5917	4862	5319	16098	100.0%			8237	7597	6975	22809	100.0%		

*Ranked according to Weighted Responses.

3. Enrolled farmers develop strong attachments and respect for the FBM instructor with one of the foundations of the FBM program being individualized personal instruction.

4. The county agent is a respected impartial information source and is sought out by both the enrolled and non-enrolled farmer.

5. Farmers make use of many sources in obtaining farm information; any program designed to enlighten farmers must take this fact into consideration. It is important that different information sources do not waste their financial resources by duplicating efforts in areas where they are not sought out as a major information source.

References

Baker, J. N. (1954). A study of the relative effectiveness of sources from which farmers get information regarding agricultural experiment station results. Ph.D... dissertation. St. Paul: University of Minnesota.

Buckridge, H. J. (1990). A history of some of the organizations that provided opportunities for nonformal adult education in America, 1727 to 1926. An annotated guide to selected sources. Unpublished EDD Dissertation. University of Southern Mississippi.

Coughenour, C.M. (1959). Agricultural agencies as information sources for farmers in a Kentucky county, 1950-1955. Lexington: University of Kentucky Agricultural Experiment Station.

Coughenour, C.M. (1962). Trends in use of recommended farm practices and farm information sources in 12 Kentucky neighborhoods. Lexington: University of Kentucky Agricultural Experiment Station.

Dillman, D.A. (1978). Mail and telephone surveys: The total design method. New York: John Wiley & Sons.

Farm & Home Publishers. (1989, 1990). County plat books. Des Moines, IA: Farm Home Publishers, Co.

Ford, S. A. & Babb, E. M. (1989). Farmer sources and uses of information. Agribusiness, 5(5), 465-476.

Gallatin, L.D. (1989). Factors affecting decisions regarding alternative agriculture enterprises by farmers and ranchers in Oklahoma. Unpublished doctoral dissertation. Stillwater: Oklahoma State University.

Gubbels, P. M. & Coolie, V. (1967). The adoption or rejection of innovations by dairy operators in the lower Fraser Valley. Ottawa, Canada: Agricultural Economics Research Council.

Hodgkins, D. L. (1957). Techniques and methods of instruction in farm management. Unpublished masters thesis. St. Paul: University of Minnesota, Department of Agricultural Education.

Persons, E. A. (1982). A bushel of wheat in thirty seconds. Vocational Education, 57(4), 28-30, May.

Richardson, J. G. & Mustian, R. D. (1988-a). Perceived capacity of the North Carolina agricultural service to deliver technological information: Reactions of agricultural producers who use extension information. Paper presented at the Southern Association of Agricultural Scientists, New Orleans, LA.

Richardson, J. G. & Mustain, R.D. (1988-b). Preferred methods for delivery of technological information by the North Carolina agricultural extension service: Opinions of agricultural producers who use extension information. Paper presented at the Southern Association of Agricultural Scientists, New Orleans, LA.

Rogers, E.M. (1983). Diffusion of innovations. New York: The Free Press.

Warner, J. C., Bracewell, E. W., Klingbeil, L. J., & Migler, J. R. (1990). Farm business management state curriculum guide. St. Paul: Minnesota State Board of Technical Colleges.

A COMPARISON OF INFORMATION SOURCES USED BY FARMERS WHO ENROLLED AND THOSE WHO DID NOT ENROLL IN SELECTED FARM BUSINESS MANAGEMENT PROGRAMS IN MINNESOTA

A Critique

Arlen W. Etling, The Pennsylvania State University--Discussant

This companion to the Minnesota study of adoption and non-adoption among dairy farmers used a different population. It examined the information sources used by farmers who enrolled in farm business management (FBM) programs and compared their preferred information sources to those farmers who did not enroll in the FBM programs.

In this study, Rogers' five adoption stages were used as part of the theoretical framework. Also the uses of information was broadened from the dairy focus of the previous study to include agronomic problems, other livestock issues, equipment and mechanical concerns, financial decisions, management functions, and personal concerns.

Procedures were not easy to understand in all cases. Why was the study limited to 12 counties? Does this limitation affect the usefulness of the study? A "modified Delphi technique" was used. How was it modified? The test-retest comparison with weighted averages was not sufficiently explained.

Usable returns from 39.1% of the non-enrolled farmers and 69.7% of farmers enrolled in FBM programs in the selected counties provided the data. The authors stated that tests for the similarity of respondents and non-respondents were made by comparing the demographics and farm data of the respondents with the data from the last agricultural census. Precisely what measures were examined? How were they examined? Do the procedures sufficiently eliminate doubts about non-response?

The characteristics of the farmers in the two study groups and their farms were compared and the findings were not surprising. Farmers enrolled in FBM programs appear to be more likely to adopt new practices. Their choices of information sources were similar to the rankings in the other Minnesota study. The county agent ranks higher and the high school teacher of agriculture ranks lower as preferred information sources by the farmers. The same questions arise? Is this a trend? Should agricultural educators be alarmed? What can be done about the situation?

The conclusions appear to be supported by the data. Recommendations, however, are absent. Could the authors formulate more conclusions based on the findings? What are the authors' recommendations to Cooperative Extension, to teachers of agricultural education at the high school level, to departments of agricultural and extension education at the university level?

SERVQUAL ASSESSMENT OF THE SERVICE QUALITY PROVIDED BY MINNESOTA EXTENSION SERVICE

Chunju Chen, Research Assistant
Gary Leske, Associate Professor
Richard Krueger, Evaluation Leader
Department of Vocational and Technical Education
University of Minnesota

Introduction

Today's society lives in a service economy (Grönroons, 1990). The quality of services provided by organizations or agencies is critical to their survival whether or not they are in the for-profit sector or the non-profit sector as is the case with Cooperative Extension Services. The quality of services determines whether or not an agency can attract public customers, and consequently, whether or not it can fulfil its mission and goals.

Alert organizational leaders are investing tremendous effort in the area of total quality management (TQM). Cooperative Extension Services have joined the quality movement. One of the major objectives of the 1992 Minnesota Extension Service (MES) Annual Conference was to explore opportunities for applying the principles of TQM (MES, 1992). This has resulted in increasing attention being directed at identification and development of valid assessment systems for measuring the quality of service being provided.

The economic efficiency of utilizing previously developed instrumentation is widely recognized. Continuous quality improvement experts have identified SERVQUAL (Zeithaml, Parasuraman and Berry, 1990) as a useful tool in service quality assessment. The construct of quality is conceptualized in the service literature as perceived quality--the consumer's judgement about an entity's overall excellence or superiority (Zeithaml, 1987). Perceived quality is a form of attitude. It is a broader concept than satisfaction although satisfaction contributes to perceived quality. Perceived quality is operationally defined by comparison of expectations with perceptions of performance (Parasuraman, Zeithaml, & Berry, 1985).

Zeithaml, Parasuraman and Berry's (1990) developmental efforts extended over a seven year period. Parasuraman, Zeithaml and Berry (1988) employed the procedures recommended in Churchill's (1979) paradigm for developing better measures of marketing constructs. It involved focus groups, in-depth interviews, survey research and extensive psychometric analyses. The resulting SERVQUAL assessment system contained 22 pairs of items asking about expectations for excellent service and perceptions of the delivered service. A seven point scale was used where 1 = strongly disagree and 7 = strongly agree that a certain service has or should have a particular expression. These researchers' work produced a five-dimension framework:

1. Tangibles--appearance of physical facilities, equipment, personnel, and communication materials (Items 1-4).

2. Reliability--ability to perform the promised service dependably and accurately (Items 5-9).

3. Responsiveness--willingness to help customers and to provide prompt service (Items 10-13).

4. Assurance--knowledge and courtesy of employees and their ability to convey trust and confidence (Items 14-17).

5. Empathy--caring and individualized attention the agency provides its customers (Items 18-22).

The SERVQUAL framework used gaps in expectations and perceptions to provide a comprehensive analysis of an organization's quality efforts. Five gaps were analyzed: Gap--customers' expectations and management perceptions of customers' expectations; Gap 2--management perceptions of customers' expectations and service quality specifications to meet the management perceived customers' expectations; Gap 3--service quality specifications and the delivered service; Gap 4--the delivered service and the service's external communications or promises to the customers; and Gap 5--customers' expectations and their perceptions of the received service. The main organizational goal for excellent service is to reduce gap 5. This study examined gaps 1 and 5.

Purpose and Objectives

The purpose of this study was to apply the SERVQUAL assessment system to the measurement of the service quality provided by MES. Seven specific objectives were addressed in the complete study. This paper addresses three objectives:

1. To modify the SERVQUAL instrument to establish face validity for MES clientele and employees.

2. To describe the difference between the clientele's expectations of the Extension Service and the MES employees' perceptions of their clientele's expectations.

3. To describe the difference between the clientele's expectations of MES and perceptions of their received service.

Procedures

Population and Samples: A census survey was mailed to 261 Minnesota County Extension Educators, 19 MES administrators, and 35 University of Minnesota Department Heads who were partially employed with MES. One design concern was the accessibility to the MES client population. The accessible population was defined as existing county office mailing lists. To obtain the sample of clientele, one county was randomly selected from each of the five MES districts. The selected County Extension Directors (CED) agreed to participate. These CEDs were provided detailed written instructions on how to randomly select 100 customers from their available mailing lists. It was assumed that the CEDs followed the sampling instructions.

Instrumentation: The SERVQUAL was modified for Extension face validity and the response "Do Not Know" was added to the scale. Then, two panels of experts were invited to critique the modified SERVQUAL. The first panel consisted of 15 professors and graduate students in University of Minnesota. The second included 15 MES County Educators and Administrators. Nineteen of these 30 panel members requested a copy of the survey and expressed their interest in the results of the study.

Then, the modified SERVQUAL was pilot tested with 100 clientele in a county not included in the final data. A reminder post card was mailed to arrive at the 100 clienteles' home on the survey due date. The return rate for the pilot study was 66%. Participants were requested to write comments on each item and the total instrument. Fifty-five percent of the respondents wrote comments about different items. This information was used to further refine the final instrument, primarily language clarification.

Administration: The CEDs were provided a copy of the survey and a sample cover letter for their individual personalization. The revised cover letter was sent under the appropriate CEDs' signature. The CEDs sent mailing labels to the researchers. The researchers generated the cover letters for the MES employees and sent the survey package to the employees and the clientele. Two weeks after the first mailing, a follow-up package was sent to the non-respondents in the respective groups.

Analysis of Data

Both descriptive and inferential statistics were used. Missing data suggested that the survey booklet format was problematic for some respondents. "Do Not Know" was treated as missing data. This response was selected frequently by clients for three items: **I-1** The Extension office uses up-to-date technologies (e.g. computer, FAX, etc.); **I-8** The Extension personnel responded quickly to community crisis; **I-17** The Extension personnel kept clientele's personal information confidential. The nature of these items suggests that the responding clientele read the survey carefully. A test-retest procedure was used with the first 100 respondents of county educators and clientele to determine the consistency of responses. A 77% return rate was achieved. The test-retest yielded a Spearman-Brown correlation coefficient of .87.

Results

A data set was obtained from 92% of the 261 MES County Educators; 85% of the 19 Administrators; 86% of the 35 Department Heads, and 66% of the 500 clientele. In response to the open-ended questions, 82% of all respondents wrote either positive or constructive comments about various items or the whole survey. They seemed to take the research seriously and wrote their various concerns about MES as well as about the study. Surprisingly, out of the 198 follow-ups, 70 respondents enclosed the first survey and stamped envelops in the returned response.

Table 1 presents the data (means, standard deviations, t-test probability results, and gap scores) on each SERVQUAL item for MES employees' perceptions of their clientele's expectations and the clientele's expectations of excellent Extension service. It also indicates whether these gap scores were practically significant based on Borg's (1987) rule of thumb, which divides the difference between means of the two variables by the standard deviation of the measure. "If the result is .50 or larger the difference is considered to have practical significance" (Borg, 1987, p. 141).

These mean scores were significantly different for: **I-2** Physical facilities should be visually appealing; **I-3** Employees should dress appropriately and professionally; **I-5** Keeping the promise in a timely manner; **I-8** Responding quickly to community crisis; **I-10** Informing clientele effectively about the service; **I-15** Consistently courteous with clientele; **I-16** Being trusted by clientele; **I-17** Keeping clientele's information confidential; and **I-18** Giving clientele individual attention. None of these scores was practically significant using Borg's (1987) rule of thumb.

Table 2 provides the data (means, standard deviations, t-test probability results, gap scores and practical significance scores) for the clientele's perceptions of their received service and their expectations of excellent service. The clientele's expectations were higher than their perceptions of the received service on all items except **I-3**: The employees dress appropriately and professionally. The clientele's expectations were significantly different than they perceived their received service for all items except **I-4**: Materials are visually attractive.

Table 1

MES Employees' Perceptions of Clientele's Expectations Compared to Clientele's Expectations of Excellent Extension Service: Means, Standard Deviations, T-Scores, Gap Scores, and Practical Significance Scores

Item	N		Mean		S.D.		P-Val	Gap	Pra. Sig.
	Em	Cl	Em	Cl	Em	Cl			
1 Up-to-date technologies	260	294	6.25	6.31	.99	.99	.96	-.06	-.06
2 Physical facilities are visually appealing	261	304	5.80	5.66	1.10	1.28	.01**	.14	.12
3 Employees dress appropriately & professionally	262	304	6.02	5.88	1.10	1.28	.00**	.14	.13
4 Materials are visually attractive	263	304	6.00	5.90	1.02	1.05	.54	.10	.09
5 Keeping the promise in a timely manner	262	302	6.61	6.57	.64	.72	.04*	.04	.06
6 Sincere interest in solving clientele's problems	262	303	6.61	6.61	.72	.74	.31	.00	.00
7 Timely responding clientele's concerns	263	304	6.58	6.57	.69	.67	.58	.01	.01
8 Responding quickly to community crisis	261	301	6.68	6.51	.62	.78	.00**	.17	.27
9 Providing up-to-date, accurate & research-based information	263	302	6.59	6.62	.70	.67	.43	-.03	-.04
10 Informing clientele effectively about the service	262	304	6.45	6.48	.68	.80	.01**	-.03	-.04
11 Giving clientele prompt service	263	303	6.54	6.52	.66	.72	.20	.02	.03
12 Willing to help	263	305	6.65	6.61	.67	.68	.63	-.04	-.05
13 Managing to find time to respond to clientele's needs	263	304	6.37	6.44	.85	.78	.13	-.07	-.08
14 Relevant knowledge to answer client's questions	262	304	6.63	6.59	.65	.71	.15	.04	.05
15 Consistently courteous with clientele	261	303	6.70	6.59	.52	.72	.00**	.13	.25
16 Being trusted by clientele	261	302	6.69	6.59	.54	.69	.00**	.10	.18
17 Keeping clientele's information confidential	260	300	6.83	6.75	.50	.63	.00**	.08	.16
18 Giving clientele individual attention	260	302	6.05	6.16	1.14	.95	.00**	-.11	-.19
19 Having operating hours convenient to the clientele	261	304	6.30	6.23	.87	.89	.71	.07	.08
20 Having employees who give client individual attention	259	301	6.14	6.22	1.02	.96	.33	-.08	-.07
21 Having the clientele's best interests in mind	262	303	6.53	6.50	.75	.75	.86	.03	.04
22 Understanding clientele's specific needs	261	303	6.48	6.37	.78	.84	.24	.11	.14

Note: Em = The Employees of MES; Cl = The clientele of MES.
** and * indicate a statistical significant difference at _=.01 and .05 levels, respectively.

Table 2

MES Clientele's Perceptions of Their Received Service and their Expectations of Excellent Service: Means, Standard Deviations, T-Scores, Gap Scores, and Practical Significance Scores

Item	N	Mean		S.D.		P-Val	Gap	Prac. Sig.
		PER	EXP	PER	EXP			
1 Up-to-date technologies	213	5.93	6.33	.86	.91	.00	-.40	-.35
2 Physical facilities are visually appealing	260	5.34	5.68	1.32	1.21	.00	-.34	-.21
3 Employees dress appropriately & professionally	256	6.24	5.89	.86	1.08	.00	.34	.30
4 Materials are visually attractive	269	5.80	5.91	1.01	1.02	.09	-.12	-.10
5 Keeping the promise in a timely manner	262	6.07	6.58	1.01	.63	.00	-.51	-.49
6 Sincere interest in solving clientele's problems	264	6.28	6.61	.88	.63	.00	-.33	-.38
7 Timely responding clientele's concerns	268	6.14	6.59	1.04	.55	.00	-.46	-.43
8 Responding quickly to community crisis	205	5.97	6.56	1.05	.61	.00	-.60	-.54~
9 Providing up-to-date, accurate & research-based information	265	6.03	6.63	.91	.58	.00	-.60	-.65~
10 Informing clientele effectively about the service	261	6.03	6.49	.91	.69	.00	-.46	-.51~
11 Giving the clientele prompt service	267	6.09	6.53	1.01	.62	.00	-.44	-.42
12 Willing to help	269	6.32	6.63	.91	.58	.00	-.31	-.34
13 Managing to find time to respond to clientele's needs	265	6.22	6.46	.94	.68	.00	-.23	-.24
14 Relevant knowledge to answer clientele's questions	264	6.14	6.60	.99	.61	.00	-.47	-.45
15 Consistently courteous with client	273	6.41	6.58	.92	.61	.00	-.17	-.18
16 Being trusted by the clientele.	265	6.32	6.60	.88	.58	.00	-.29	-.32
17 Keeping clientele's information confidential	209	6.37	6.74	.85	.48	.00	-.37	-.44
18 Giving clientele individual attention.	263	5.98	6.20	1.18	.87	.00	-.22	-.17
19 Having operating hours convenient to clientele.	263	5.96	6.23	1.10	.86	.00	-.27	-.22
20 Having employees who give clientele individual attention.	261	6.03	6.27	1.21	.85	.00	-.24	-.20
21 Having clientele's best interests in mind.	259	6.06	6.51	1.03	.68	.00	-.45	-.43
22 Understanding clientele's specific needs.	253	5.89	6.40	1.10	.73	.00	-.50	-.43

Note: PER = Perceptions; EXP = Expectations.
"~" indicates practical significance based on Borg's rule of thumb (1987).

Conclusions

1. The modified SERVQUAL was well received in the instrument development process and field testing, suggesting the face validity was good.

2. The gaps in MES employees' perceptions of the clientele's expectations of service quality and clienteles' expectations of the service were significantly different for nine items. For two of these significantly different items, "Informing clientele effectively about the service" (**I-10**) and "Giving clientele individual attention" (**I-18**), the clientele's expectations were higher than the MES employees' perceptions of their clientele's expectations. While these findings were indicative that MES employees need to work to obtain a better understanding of the clientele's expectations related to service, the practical significance of these gaps was not supported by Borg's (1987) rule of thumb.

3. The MES clientele's expectations of an excellent service were higher than their perceptions of the received service on all questions except **I-3** The employees dress appropriately and professionally. The clientele's expectations were significantly different than they perceived their received service for all items except **I-4** Materials are visually attractive. These findings suggest there is an apparent need to examine the quality of service being provided. However, using Borg's (1987) rule of thumb, there was practical significance for only three items: **I-8** Responding quickly to community crisis; **I-9** Providing up-to-date accurate and research-based information; and **I-10** Informing clientele effectively about the service. These items merit additional examination as MES work to provide quality service.

4. MES personnel need to determine what a practically significant difference in gap scores is when they evaluate the service quality provided by MES using the modified SERVQUAL instrument.

Note

This study was supported in part by grants from the Minnesota Extension Service and the Computer and Information Services of the University of Minnesota.

References

Borg, W. R. (1987). Applying educational research: A practical guide for teachers. New York: Longman.

Churchill, G. (1979). A paradigm for developing better measures of marketing constructs. Journal of Marketing Research, 16 (February), 64-73.

Grönroons, C. (1990). Service management and marketing. Lexington, MA: Lexington Books.

Minnesota Extension Service. (1992). Total quality improvement (A pamphlet for Minnesota Extension Service Annual Conference, October 1992). St. Paul: University of Minnesota.

Parasuraman, A., Zeithaml, V. A. & Berry, L. L. (1985). A conceptual model of service quality and its implications for future research. Journal of Marketing, 49 (Fall), 41-50.

Parasuraman, A., Zeithaml, V. A. & Berry, L. L. (1988). SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. Journal of Retailing, 64 (Spring), 12-37.

Zeithaml, V. (1987). Defining and relating price, perceived quality, and perceived value. Report No. 87-101, Cambridge, MA: Marketing Science Institute.

Zeithaml, V. A., Parasuraman & Berry, L. L. (1990). Delivering quality service: Balancing customer perceptions and expectations. New York: The Free Press.

SERVQUAL ASSESSMENT OF THE SERVICE QUALITY PROVIDED BY MINNESOTA EXTENSION SERVICE

A Critique

Arlen W. Etling, The Pennsylvania State University--Discussant

Chen, Leske, and Krueger conducted this study to measure the "service quality" of the Minnesota Extension Service. To accomplish this purpose they modified a new assessment instrument, called SERVQUAL.

The objectives of this study were precise. The problem was clearly defined and it is an important to problem to extension educators and their stakeholders. Appropriate literature was cited as the theoretical framework was developed. Apparently SERVQUAL is a new tool, developed to measure "marketing constructs" and adapted in this study to measure client satisfaction with Cooperative Extension.

The procedures for modifying the SERVQUAL instrument were explained in depth. Only one question arises, what do the authors mean when they say that the survey booklet format was "problematic for some respondents?"

Descriptive and inferential statistics were used to analyze the responses by Minnesota Extension Service educators and their clients. The results were presented in two tables. The first compared MES employees' perceptions of clients' expectations with the clients' own expectations of "excellent extension service." The second table compared clients' perceptions of their received service with their expectations of excellent service. Four conclusions were drawn from the findings.

The only disappointment with this study is that the authors were able to present only four conclusions and no recommendations. The findings appear to provide a basis for much more consideration and implications. The three objectives that were met in this study were part of a larger study which included four more objectives. Perhaps the overall study results, conclusions and recommendations would present a clearer picture.

Any extension educator who reads this study will also have questions about SERVQUAL. What is the instrument format? Is it now ready for assessment of the "service quality" of other state extension services? Would the authors offer any recommendations for its wider application?

NAERM Third Session
10:30 a.m.-12:00 noon
Concurrent Session E

Theme: Distance Education in Agriculture

Topic 1: An assessment of the educational delivery systems employed by commercial field agronomists in publicly and privately owned cooperatives

Speakers: Robert Martin, Delbert Voight (Iowa State University)

Topic 2: Distance education in agriculture: Teaching and learning through videotape

Speakers: Greg Miller, Mark Honeyman (Iowa State University)

Topic 3: A conceptual model for effectively planning and delivering distance education courses and programs in agriculture

Speakers: Gary Jackson (Mississippi State University
Blannie Bowen (The Pennsylvania State University)

Topic 4: The extent student teachers utilized the problem-solving approach to teaching during the student teaching practicum

Speakers: Bryan Garton, Jamie Cano (The Ohio State University)

Discussant: John Parmley (Kansas State University)

Chairperson: Max McGhee (University of Florida)

Facilitator: Jasper Lee (Mississippi State University)

AN ASSESSMENT OF THE EDUCATIONAL DELIVERY SYSTEMS EMPLOYED BY COMMERCIAL FIELD AGRONOMISTS IN PUBLICLY AND PRIVATELY OWNED COOPERATIVES

Robert A. Martin
Professor
Iowa State University

Delbert G. Voight, Jr.
Agronomist
Cenex-Land-o-Lakes

The role of the Extension Service is changing rapidly across the country. Each state has been doing more with less money and fewer people (Jones, 1992; Martin & Omer, 1988). Jones contends that with Iowa's mission in Extension being that of meeting the needs of the whole community and not solely agriculture, the organization has to find more efficient ways of utilizing funds to meet the needs of the agriculture industry.

The target clientele of Extension has expanded from actual farmers and farm families to homeowners and city dwellers (Quinlan, 1991). Extension professionals have had to be all things to all people in order to adapt to the clientele needs. Taken a step further, they have had to be not only well-versed in the trades but also psychology and family planning. In-depth surveys are constantly being performed to determine the needs of communities.

While the actual and potential target audience for the Cooperative Extension Service has expanded, there continues to be a need to provide information to persons who are directly involved in the agriculture production process. The agriculture services sector has been characterized by dramatic growth in recent years. Financial and technical advisory services have been dramatically affected. Also, specialized information services have, to some degree, supplemented the function which was historically performed by the Cooperative Extension Service (Martin et al., 1990, p. 4).

The clients of the Extension Service have traditionally been the general public, but today a large portion of the clients are industry employees. An example would be chemical companies funding research at universities as well as using the Extension Service to learn of new technologies (Hartzler, 1992). The service may be direct to the farmer through local Extension offices or through a local crop consulting firm which often obtains information from Extension bulletins and meetings and relays the information to the farmer. Do these agronomists deliver information in the most effective way? What are the systems they are using to deliver their information? What training is needed regarding the use of delivery systems by commercial field agronomists?

With the marked down-sizing or right-sizing of the Extension organization in Iowa, farmers will have to rely more on commercial field agronomists, and fellow farmers to receive new information on raising their crops. These agronomists seek new technologies and knowledge from Extension personnel as is evident in their attendance at the periodic Field Extension Education Labs (FEEL) in Iowa. The FEEL program is located at the Iowa State University agronomy farm. This program offers agronomists educational opportunities several times a year addressing seasonal problems associated with crop production.

The field agronomist uses this information to educate the farmer and solve potential or current problems. In addition to the FEEL program, numerous meetings are held throughout the year to assist agronomists in learning new technologies regarding field crops. County, area, and state Extension specialists continually develop publications to assist farmers and agronomists.

The FEEL programs organized by agronomy specialists at Iowa State University are focused on technical crop production. There are few education programs involving the best means to transfer this technical agronomic knowledge to the farmer. Strict emphasis is on the technical education of the farmer (Hall, 1991).

There is a need, due to the impending cooperation between the Extension Service and agribusiness, to know what educational systems field agronomists use to help producers gain new information, knowledge, and skills relating to production practices. The development and use of specific educational delivery systems is thought to have a positive impact on improving the transfer of knowledge (Martin, 1992; Knox, 1987). Since there has not been a full study of the delivery systems of these agronomists, this study attempted to identify training needs that would improve delivery of new technology.

Purpose

The main purpose of this study was to identify the educational delivery systems being used by agronomists to provide information to farmers. The main focus of the study was the analysis of the delivery systems used by field agronomists. These systems focus on strategies used by the agronomists to educate farmers. These strategies or teaching techniques include instructional systems, group process systems and tools, and educational processes appropriate to the delivery of agriculture technology. A secondary purpose of the study was to determine the agronomists' training needs regarding educational processes. Specifically, what educational process programs should be offered to commercial field agronomists?

Objectives

The specific objectives of the study were to identify the educational delivery systems used by commercial field agronomists in Iowa; identify the perceptions held by agronomists regarding the extent to which extension services are using the selected educational delivery systems; assess the educational training needs of commercial field agronomists in Iowa; identify the demographic characteristics of the population; and compare selected demographic characteristics to the perceptions of commercial field agronomists regarding the extent to which extension uses the educational delivery systems, the delivery systems used and the training needs of the commercial field agronomists.

Methods/Procedures

The research design of this study was of the descriptive type. This type of research illustrates the situation at the time of the study. A descriptive survey design was appropriate given the exploratory nature of the study and nature of the data that was collected.

The population of the study consisted of 419 commercial field agronomists. The commercial field agronomists were members of the Iowa Fertilizer and Chemical Association (IFCA) and were employed by farmer cooperatives in Iowa. A 1991 IFCA directory was obtained to ensure an up-to-date listing of commercial field agronomists.

The names and addresses of only the commercial field agronomists in the IFCA were entered into a file program on the Macintosh computer, alphabetized and numbered for ease in future reference. These numbers corresponded to the numbers placed on the instrument. The total population size was 419. The study focused on the total population therefore, no sample was drawn.

A researcher designed questionnaire was the instrument used to extract the information to achieve the objectives of the study. The survey instrument consisted of four parts: the first part of the survey questionnaire consisted of questions referring to delivery systems currently used by the agronomists; the second part of the questionnaire dealt with the perceptions of the commercial field agronomist with regard to the extent to which extension professionals use the various selected delivery methods/tools; the third part of the survey questionnaire focused on the perceived educational and process training needs of the commercial field agronomist; and the fourth part of the questionnaire collected information related to demographics.

The first three parts of the instrument made use of a five point scale commonly known as a Likert-type scale. The descriptors for the scales were as follows: 1=(N)one; 2=(V)ery (L)ittle; 3=(S)ome; 4=(M)oderate; 5=(H)igh. The final segment of the survey focused on demographics of the respondents. In order to validate the content of the questionnaire, it was reviewed by the researcher, major professor, two professors from Iowa State University Agronomy Extension, and one manager of a farmer's cooperative.

The instrument, a mailed questionnaire, yielded a total of 195 usable questionnaires within 15 mailing days. A follow-up postcard was mailed to all non-respondents. A total of 219 questionnaires were returned for a response rate of 52 percent. A follow-up of a selected number of non-respondents (10) was conducted and no differences were found between respondents and non-respondents. The post-hoc reliability testing of the instrument resulted in an overall reliability coefficient of 0.81.

The following statistical procedures were used to analyze the information generated by the study: means, standard deviations, frequency counts, and percentages. These statistical procedures were chosen for their appropriateness for the research objectives.

Findings

The major findings of the study were as follows:

1. Ninety-seven percent of the respondents were male. The majority (67.14%) of the respondents were between the ages of 30 and 49 years. Fifty-one percent of the respondents were employed by their respective cooperative for 1 to 9 years. The north central region in Iowa produced a third of the responses (32.4%).

2. The majority (55.7%) of the commercial field agronomists had only a high school education. Forty-four percent of the respondents possessed an advanced degree. Major area of study in school was varied.

3. The educational delivery systems employed most by the respondents were one-on-one discussions, group discussions, newsletters, problem solving, on-farm experiments, on-site instruction, displays, exhibits and demonstrations (Table 1).

Perceptions of the commercial field agronomists regarding the educational delivery systems utilized by the Extension Service indicated that newsletters, overhead transparencies, lectures, group discussion, demonstrations, on-farm experiments, problem solving, and slide sets were most extensively used strategies or tools (Table 2).

The educational delivery systems identified as ones in which agronomists need training were on-farm experiments, demonstrations, problem solving, on-site instruction, newsletters, group discussions, and one-on-one discussions (Table 3).

Table 1
Mean Ratings and Standard Deviations Regarding Perceived Use of Selected Educational Delivery Systems by Commercial Field Agronomists in Iowa

Delivery Systems	N	Mean	STD
One-on-one discussions	205	4.45	.97
Group discussion	206	3.94	.84
Newsletters	206	3.78	1.08
Problem solving	206	3.69	1.04
On-farm experiments	205	3.45	1.08
On-site instruction	205	3.38	1.09
Displays/exhibits	206	3.17	.98
Demonstrations	206	3.17	.89
Video	205	2.84	.95
Field trips	206	2.76	.97
Overhead transparencies	206	2.53	1.16
Lectures	206	2.53	1.11
Buzz groups	203	2.52	1.05
Magazine articles	205	2.35	1.25
Radio	206	2.28	1.10
Simulations	204	2.27	1.00
Slide sets	206	2.26	1.09
Flip charts	203	2.07	.98
Television	205	1.56	.98

Scale: 1=(N)one; 2=(L)ittle; 3=(S)ome; 4=(M)oderate, 5=(H)igh

Table 2
Means and Standard Deviations of the Perceptions Held by Commercial Field Agronomists in Iowa Regarding the Extent to which the Extension Service Uses Selected Educational Delivery Systems

Delivery Systems	N	Mean	STD
Newsletters	201	4.04	.88
Lectures	200	3.54	1.04
Group discussion	201	3.49	.94
Overhead transparencies	200	3.47	1.09
Demonstrations	201	3.45	1.04
On-farm experiments	199	3.41	1.15
Problem solving	201	3.25	.92
Slide sets	200	3.19	1.13
Displays/exhibits	198	3.08	1.06
Field trips	199	3.11	.99
On-site instruction	198	3.08	1.06
Video	195	3.07	.96
One-on-one discussions	202	2.86	.99
Simulations	197	2.72	1.06
Buzz groups	197	2.72	.96
Magazine articles	198	2.69	1.06
Flip charts	198	2.64	.98
Radio	200	2.57	1.14
Television	199	2.08	1.07

Scale: 1=(N)one; 2=(L)ittle; 3=(S)ome; 4=(M)oderate, 5=(H)igh

Table 3
Mean Ratings and Standard Deviations of the Perceived Need for Training in Educational Delivery Systems According to Commercial Field Agronomists in Iowa

Delivery Systems	N	Mean	STD
On-farm experiments	209	3.85	.99
Demonstrations	209	3.73	.98
On-site instruction	209	3.69	1.00
Problem solving	209	3.69	1.04
Newsletters	209	3.68	1.10
Group discussion	209	3.67	1.08
One-on-one discussions	209	3.56	1.18
Field trips	209	3.44	1.05
Video	209	3.14	1.05
Displays/exhibits	209	3.04	.94
Lectures	209	2.96	1.18
Magazine articles	209	2.96	1.18
Simulations	209	2.92	.94
Buzz groups	207	2.88	1.07
Slide sets	209	2.57	1.06
Overhead transparencies	209	2.57	1.06
Radio	209	2.56	1.10
Flip charts	209	2.26	.94
Television	208	2.26	1.12

Scale: 1=(N)one; 2=(L)ittle; 3=(S)ome; 4=(M)oderate, 5=(H)igh

Age, years of experience and education had little to do with use of delivery systems. Some systems were perceived to be used more than others based on these factors but the areas of significant differences were limited and had little practical value.

Conclusions

After conducting the study and analyzing the data, the following conclusions can be made: commercial field agronomists in Iowa use a limited number of educational delivery systems; commercial field agronomists in Iowa perceive that Extension professionals use a limited number of educational delivery systems; field agronomists indicated a need for training in the delivery systems they most often use; comparisons of the data based on age, length of employment and educational level yielded limited differences in the perceptions regarding the use of educational delivery systems; field agronomists in Iowa have an interest in gaining more skills regarding delivering information and technology to farmers; and agronomists tend to use the systems modeled by Extension professionals.

Recommendations

Based on the findings and conclusions of this study the following recommendations were made: the results of this study should be shared with Extension administrators at Iowa State University and with individuals involved in program planning and delivery of agronomic technology; an educational strategy workshop should be designed and offered for commercial field agronomists regarding the proper use of educational delivery systems; and cooperative managers should use the findings to develop educational workshops for the commercial field agronomists regarding the proper use of educational delivery systems.

Implications of Agricultural Education

The findings of the study indicated that there is a need to create a balance between the process and product of technology transfer. The delivery process needs to get as much attention as the technology itself. The study confirmed what several other studies (Creswell, 1991, Hillyard, 1979, Beck, 1990, Martward & Omer, 1988) indicated that Agricultural Education has a role to play in helping technicians in agriculture improve their delivery of information to those who can make best use for it. Commercial field agronomists have some of the same needs for training in educational delivery systems as Extension professionals, agriculture salespeople and other technical agriculturists. Agriculture educators of all kinds (formal and nonformal) have a responsibility to provide not only the technical information to upgrade professionals in the field (e.g. agronomists) but they should equip these professionals to be better presenters of learning among adult farmers and other agriculturists. The implications of this study go far beyond the impact on Extension's role and the transfer of technology. While these impacts are significant, agricultural educators may have discovered another clientele group which requires its services. Enhancing the presentation and communication skills of technical experts may have a positive impact on the transfer of technology. The expanded clientele group of Agricultural Education challenges the profession to adjust its thinking and reframe its mission.

References

Beck, J. A. (1990). Instructional strategies & resources for literacy and employment training programs. Washington DC: Employment and Training Administration.

Creswell, J. L. (1991). An identification and assessment of extension education delivery system for training of private applicators. Ph.D. dissertation, Iowa State University, pp. 11-26.

Hall, E. (1991). Personal Interview, Extension Specialist, Iowa State University.

Hartzler, R. (1992). Personal Interview, Agronomist and Extension Specialist, Iowa State University.

Hillyard, L. L. (1979). Educational needs of adult farmers in the West Liberty Community School District. Unpublished masters thesis, Ames: Iowa State University.

Jones, L. (1992). Personal Interview, Extension Specialist, Iowa State University.

Knox, A. B. (1987). Helping adults learn. San Francisco: Jossey-Bass, Inc.

Martin, R. A. (1992). Lecture notes from a course on International Agriculture Education. (Ag. Ed. 561). Ames: Iowa State University.

Martin, R. A. & Omer, M. H. (1988). Factors associated with participation of Iowa young farmers in agriculture extension programs. Journal of American Association of Teacher Education in Agriculture, 29(1), 45-52.

Quinlan, D. (1991). Personal Interview, Extension Agent-Agriculture, Iowa State University.

AN ASSESSMENT OF THE EDUCATIONAL DELIVERY SYSTEMS EMPLOYED BY COMMERCIAL FIELD AGRONOMISTS IN PUBLICLY AND PRIVATELY OWNED COOPERATIVES

A Critique

John D. Parmley, Kansas State University - Discussant

Theoretical Framework - The authors address the challenge faced by Extension Services as they seek to increase services to historically non-traditional clientele groups. According to the authors, expansion of services to help meet the needs of the "whole community" rather than sole focus on agriculture has created new challenges and opportunities as Extension Services redefine their educational missions. While the paper provides a brief discussion of the emerging relationship between Extension and private sector providers of agricultural instruction, the authors seem to be working from a model which features Extension as a role model from which private sector educators should pattern their instructional strategies. The reviewer recommends that the authors present this model and summarize the literature upon which it may be based. It is difficult to understand the total role of Extension in this study.

Methodology - The procedures employed during this investigation seem to be appropriate for the identified objectives. At the same time, the reviewer suggests that the authors reexamine the discussions provided in the third sentence of the Methods/Procedures section, "A descriptive survey design was appropriate given the exploratory nature of the study and nature of the data that was collected." The choice of words in the sentence could lead a reader to believe that overall research design issues were addressed following the collection of data.

The reviewer also questions whether or not a field test was conducted during the development of the research instrument. While the authors reported a post-hoc reliability coefficient, it is not clear that a field test and resulting reliability coefficient played a role in determining the appropriateness of the research instrument.

Findings, Conclusions and Recommendations - Without an adequate description of the role of Extension in this investigation, it is difficult to understand the significance of the data which summarize "the perceptions held by the commercial field agronomists n Iowa regarding the extent to which the Extension Service uses selected educational delivery systems."

Concluding Comments - The authors are to be commended for addressing an emerging challenge confronting the Extension Service.

DISTANCE EDUCATION IN AGRICULTURE: TEACHING AND LEARNING THROUGH VIDEOTAPE

Greg Miller, Assistant Professor
Mark Honeyman, Assistant Professor
Department of Agricultural Education & Studies
Iowa State University

Introduction

Videotaped courses have become the primary delivery system for the Iowa State University College of Agriculture distance education program, according to Miller and Honeyman (1993). The use of videotaped instruction is expected to increase, and research is needed to develop and improve instructional strategies effective for teaching through videotape. Research with a focus on improving specific distance education technologies such as videotape is in the mainstream of what is considered appropriate. Whereas, past research that attempted to demonstrate the superiority of specific educational media over other media and "traditional classroom instruction" was unsuccessful (Thompson, Simonson, & Hargrave, 1991).

The clientele served by the Iowa State University College of Agriculture distance education program are adults who possess a considerable amount of academic and life experience related to agriculture (Miller & Honeyman, 1993). Are they receiving instruction that accounts for their background and their educational needs? Knox (1986, p. xi) wrote that "most instructors in adult education programs are expert in the content that they teach, but they usually have little preparation in the process of helping adults learn." Agricultural education researchers (Martin & Odubiya, 1991; Martin & Omer, 1990; Voight, 1992) have likewise recognized the need to place greater emphasis on how content is taught.

Although a single comprehensive theory of distance education may not be possible (Perraton, 1987), several authors have identified instructional practices believed to be effective in teaching through videotape. Thompson et al. (1991) reviewed the literature on effective one-way instructional television and identified a number of characteristics associated with effective programs. Also, Cyrs and Smith (1990) assembled several instruments for evaluating teleclass teaching. From a review of research and from experience, Gibson (1985) proposed a list of heuristics for instructional design in distance education. Furthermore, Wilson (1991) identified several conditions specific to distance education necessary for student learning.

Agricultural educators have a role to play in developing and improving the method and process of technology-mediated instruction (Newcomb, 1993). To do this most effectively, agricultural educators must know their audience, identify effective distance education practices, and tailor programs to meet the needs of agricultural audiences (Miller & Honeyman, 1993).

What strategies do students utilize to achieve success in distance education programs? Do agricultural distance learners perceive effective videotape instructional practices described in the literature as important for their learning, and to what extent are these practices utilized by agricultural educators? This study will provide a basis to begin formulating answers to these questions.

Purpose and Objectives

The purpose of this descriptive correlational study was to investigate the videotape-utilization practices of students enrolled in the Iowa State University College of Agriculture off-campus degree program. Additionally, the researchers sought to investigate student perceptions of the importance and occurrence of effective videotape instructional practices. The objectives of the study were to:

1. Describe videotape-utilization practices of students enrolled in the Iowa State University College of Agriculture off-campus videotaped courses during Fall Semester 1992.

2. Describe student perceptions regarding the importance of, and the extent to which, effective-videotape instructional practices were utilized.

3. Describe relationships among selected demographic variables, selected videotape-utilization practices, the perceived importance of effective videotape instructional practices, and student perceptions of the extent to which effective videotape instructional practices were utilized.

Procedures

The population for the study consisted only of active students who enrolled in off-campus videotaped courses offered by the College of Agriculture at Iowa State University (N=200). Any student who enrolled in at least one videotaped course during 1992 was considered active. The accessible population consisted of students enrolled in two distinct videotaped courses for Fall Semester of 1992. Seventy-eight students were enrolled during Fall Semester, and all were included in the sample.

The questionnaire utilized in the study was developed by the researchers and consisted of four parts: the importance of effective videotape instructional practices, the occurrence of effective videotape instructional practices, attitude toward videotaped instruction, videotape utilization practices, and selected demographic questions. Content and face validity for the questionnaire were established by a panel of faculty in the Iowa State University Agricultural Education and Studies Department.

Thirty-five statements representing effective videotape instructional practices were identified from the literature (Cyrs & Smith, 1990; Gibson, 1985; Thompson et al., 1991; Wilson, 1991). Students were asked to indicate their level of agreement with statements regarding the extent to which the practices were important and the extent to which they occurred, by using a Likert-type scale with five response categories ranging from strongly disagree (1) to strongly agree (5). Cronbach's alpha was calculated to estimate the reliability of the scales. The resulting coefficients were .95 for the importance scale and .94 for the occurrence scale.

The attitudinal instrument consisted of 13 Likert-type items, with five response categories ranging from strongly disagree (1) to strongly agree (5). Cronbach's alpha was used to assess the reliability of the attitudinal instrument. The resulting coefficient was .83.

Data for the study were collected by mailed questionnaire. The questionnaire, along with a cover letter and a stamped return envelope, was sent to all (n = 78) students enrolled in an off-campus videotaped course during the Fall Semester of 1992. Approximately 3 weeks after the initial package was mailed, telephone calls were made to all nonrespondents, encouraging them to complete the questionnaire and return it in the envelope provided. Approximately 1 week after the first follow-up, a second telephone follow-up of nonrespondents was completed. After each follow-up, additional questionnaires were sent to all students who had lost or discarded the original questionnaire. Sixty-one students completed and returned the questionnaire for a response rate of 78%. Students participating in the study were not a probability sample of active students who enrolled in off-campus videotaped courses. Also, no formal means were utilized to compare respondents and non-respondents. Therefore, results were not generalized beyond the respondents.

Analysis of Data

All data were analyzed with the SPSS/PC+ personal computer program. Appropriate statistics for description were used, and all correlation coefficients were interpreted using Davis' (1971) descriptors.

Results

Students were asked to indicate whether or not they employed selected videotape-utilization practices. Approximately 39% (24) of the respondents watched the videotapes straight through without interruption, 54.1% (33) watched the videos more than one time, 98.4% (60) took notes, and 45.9% (28) viewed the videotapes when they were received.

Students were asked to indicate the average amount of time they spent viewing each 120-minute videotape. Viewing time ranged from a low of 61 to a high of 360 minutes. Approximately 16% (9) of the respondents spent 61-120 minutes viewing each videotape, 46.6% (27) spent 121-180 minutes, 25.8% (15) spent 181-240 minutes, 10.4% (6) spent 241-300 minutes, and 1.7% (1) spent more than 300 minutes viewing each tape. The mean viewing time reported by respondents was 184.1 minutes, with a standard deviation of 57.8.

Respondents were asked to indicate the time of day during which they typically viewed the videotapes. A majority (62.3%) of the respondents reported typically viewing the videotapes during the evening hours (6:00 to 11:59 p.m.). The second most (14.8%) frequently cited viewing time was during the morning hours (6:00 to 11:59 a.m.). Approximately 8% of the respondents viewed the videotapes during the afternoon hours (12:00 to 5:59 PM). Another 6% of the respondents viewed tapes between the hours of 12:00 and 5:59 AM, and the remaining respondents indicated more than 1 viewing time.

On a five-point scale, students were asked to indicate how important each of 35 effective videotape instructional practices was to them in regard to their learning. Table 1 shows that 1.6% (1) of the students provided a mean score in the range of 2.01 to 2.50 (disagree) and 1.6% (1) provided a mean score between 2.51 and 3.50 (undecided). The remaining 96.7% (59) of the respondents provided mean scores greater than 3.50 (agree to strongly agree). The overall mean score for perceived importance of the 35 effective videotape instructional practices was 4.19 (agree) with a standard deviation of .48.

Table 1
Overall Mean Scores for the Perceived Importance of 35 Effective Videotape Instructional Practices

Mean	f	%	cum. %
2.01-2.50	1	1.6	1.6
2.51-3.00	0	0.0	1.6
3.01-3.50	1	1.6	3.3
3.51-4.00	16	26.2	29.5
4.01-4.50	28	45.9	75.4
4.51-5.00	15	24.6	100.0
Total	61	100.0	100.0

Mean 4.19 Std. Dev. .48
Note: Based on scale: 1=strongly disagree; 2=disagree; 3=undecided; 4=agree; 5=strongly agree.

On a five-point scale, students were asked to indicate the extent to which 35 effective videotape instructional practices had occurred. Table 2 shows that 1.6% (1) of the students provided a mean score in the range of 2.01 to 2.50 (disagree), and 14.8% (9) provided mean scores between 2.51 and 3.50 (undecided). The remaining 83.6% (51) students provided mean scores greater than 3.50 (agree to strongly agree). The overall mean score for the perceived occurrence of the 35 effective videotape instructional practices was 3.81 (agree) with a standard deviation of .50.

Table 2
Overall Mean Scores for the Perceived Occurrence of 35 Effective Videotape Instructional Practices

Mean	f	%	cum. %
2.01-2.50	1	1.6	1.6
2.51-3.00	4	6.6	8.2
3.01-3.50	5	8.2	16.4
3.51-4.00	32	52.5	68.9
4.01-4.50	14	22.9	91.8
4.51-5.00	5	8.2	100.0
Total	61	100.0	100.0

Mean 3.81 Std. Dev. .50
Note: Based on scale: 1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; 5

Pearson correlations, point biserial correlations, and phi coefficients were calculated to describe the relationships among selected demographic variables, selected videotape-utilization practices, and perceived importance and occurrence of effective videotape instructional practices. Low positive relationships were found between student attitude toward videotaped instruction and student age, number of videotaped courses taken, and time spent viewing each videotape. Students with more positive attitudes toward videotaped instruction were older, had taken more videotaped courses, and spent more time viewing each videotape. A moderate negative relationship was found between student attitude and whether students perceived the instructor to be an information provider or a facilitator of learning. Students who perceived their instructor to be a facilitator of learning had more positive attitudes toward videotaped instruction. Also, a substantial positive relationship was found between student attitude and perceived occurrence of effective videotape instructional practices. Students had more positive attitudes toward videotaped instruction when they perceived to a greater extent the occurrence of effective videotape instructional practices. A moderate negative association was found between whether instructors were perceived by students as information providers or as facilitators of learning and the perceived occurrence of effective videotape instructional practices. Students who perceived to a greater extent the occurrence of effective videotape instructional practices were more likely to perceive their instructor as a facilitator of learning (Table 3).

Students were asked to describe briefly the strategies they have found to be effective in learning from videotape. Approximately 98% (56) of the respondents described their approach to learning from the videotaped lectures. Several students described strategies that might suggest the instructors covered too much material too quickly. Some of the statements include:

> I like to watch the tape first without taking notes and then take notes the second time through after the content and pace of delivery is familiar to me.
>
> I pause many times through each session.

Table 3

Summary of relationships among selected demographic variables, selected videotape utilization practices, and perceived importance and occurrence of effective videotape instructional practices

Variable	(X1)	(X2)	(X3)	(X4)	(X5)	(X6)	(X7)	(X8)	(X9)	(Y1)
Facilitator of learning learning^a (X1)	1.00	-.07	-.09	-.03	-.08	-.02	-.18	-.16	-.37	-.30
Watch videotapes more than once^b (X2)		1.00	-.11	.03	.13	-.16	.46	.03	.12	.12
View videotapes as received^b (X3)			1.00	-.13	-.13	-.06	.01	.03	-.04	-.02
Watch videotapes straight through without interruption^b (X4)				1.00	-.28	.10	.11	.16	.15	.12
Student age (X5)					1.00	.24	-.08	-.05	.17	.24
Number of videotaped courses taken (X6)						1.00	.07	.09	.02	.24
Time spent viewing each videotape (X7)							1.00	.18	.23	.25
Importance of effective practices (X8)								1.00	.57	.17
Occurrence of effective practices (X9)									1.00	.52
Attitude toward videotaped instruction (Y1)										1.00

[a] 0 = facilitator of learning; 1 = information provider.

[b] 0 = no; 1 = yes.

Note: phi coefficients were reported for relationships among variables (X1)-(X4), point biserial coefficients were reported for relationships between variables (X1)-(X4) and (X5)-(Y1), pearson correlations were reported for relationships among variables (X5)-(Y1).

> Often, the material is presented too quickly (rewinding is used frequently).
>
> I watch the tape when received at about thirty minutes per session.

Students provided many other comments that may prove useful in designing more effective videotaped lectures. Some of these include:

> It works best for me to have a scheduled time to view a tape, much the same as a classroom.
>
> I often put the tape on still in order to copy notes, charts, etc., so I can then concentrate on what is being said.
>
> I record important information with the tape number and counter number so I can fast forward to the exact spot if I need to review.

One student commented that "these courses could care less if the student learns for real world application." Although this comment did not describe a learning strategy, it certainly sheds light on the desire of some students to understand the application of the material that they learn.

Conclusions

1. Most of the respondents do not watch videotapes straight through without interruption, and almost half of the students watch the videotapes more than one time. In fact, 84% of the students spent two or more hours viewing each of the two-hour videotapes. Perhaps students were capitalizing on their ability to control the pace of instruction, or more likely they were compensating for the fact that instructors operate more as information providers and less as facilitators of learning.

2. Students perceived the 35 effective-videotape instructional practices identified in the literature as being important to their learning.

3. Overall, students perceived that their instructors were utilizing the 35 effective videotape instructional practices identified from the literature. However, the level of agreement for the perceived occurrence of the practices was consistently less than the level of agreement with their perceived importance.

4. Students had more positive attitudes toward videotaped instruction when they perceived their instructor to be a facilitator of learning as opposed to an information provider.

5. Students had more positive attitudes toward videotaped instruction when they perceived to a greater extent the occurrence of effective videotape instructional practices.

Recommendations

1. Instructors for videotaped classes should slow the pace of their lessons to accommodate the preferences and learning strategies of their students. Perhaps the instructors could identify the most important concepts they wish to teach, and use examples and activities to demonstrate their real-world application. In fact, the highest mean for an individual item on the importance scale was "real-world application of content is stressed by the instructor." The amount of material covered would necessarily be less, but student learning and satisfaction could be increased.

2. Instructors for videotaped courses offered by the Iowa State University College of Agriculture should be provided an opportunity to participate in a workshop designed to improve their videotape-teaching skills. During the workshops, instructors would learn about the videotape utilization practices of students, student learning strategies, and strategies for integrating effective videotape instructional practices into their lessons. Instructors of videotaped classes must learn to be more than "talking heads." They should become facilitators of the learning process.

3. Further research is needed to test experimentally the influence of so-called effective videotape instructional practices on student achievement and satisfaction. Based upon the results of this study, manipulating the videotaped lesson to accommodate the attention span and viewing patterns of students is recommended. Another promising manipulation would involve the insertion of activities that emphasize real-world application of concepts and higher-order thinking skills at specified intervals.

4. Respondents indicated a desire to receive suggestions on how they could learn most effectively from videotape. Findings from this study do not provide a sufficient basis for making such suggestions. Therefore, research should be conducted to contrast the videotape-utilization practices of high- and low-achieving students in videotaped courses.

References

Cyrs, T. E. & Smith, F. A. (1990). Teleclass teaching: A resource guide (2nd ed.). Las Cruces: New Mexico State University, College of Human and Community Services, Center for Educational Development.

Davis, J. A. (1971). Elementary survey analysis. Englewood Cliffs, NJ: Prentice-Hall.

Gibson, T. L. (1985). Heuristics of instructional design for distance education. (ERIC Document Reproduction Service No. ED 337 081).

Knox, A. B. (1986). Helping adults learn. San Francisco: Jossey-Bass.

Martin, R. A. & Odubiya, A. (1991). Perceptions of Iowa vocational agriculture teachers regarding methods used in agricultural education. Journal of Agricultural Education, 32(1), 13-17.

Martin, R. A. & Omer, M. H. (1990). Perceptions regarding instructional methods used in adult agricultural education programs. Journal of Agricultural Education, 31(2) 2-6.

Miller, G. & Honeyman, M. (1993). Attributes and attitudes of students enrolled in agriculture off-campus videotaped courses. Manuscript submitted to the Journal of Agricultural Education.

Newcomb, L. H. (1993). Transforming university programs of agricultural education. Journal of Agricultural Education, 34(1), 1-10.

Perraton, H. (1987). The roles of theory and generalization in the practice of distance education: Three related systems. (ERIC Document Reproduction Service No. ED 290 015).

Thompson, A. D., Simonson, M. R., & Hargrave, C. P. (1991). Educational technology: A review of the research. Ames: Iowa State University, College of Education, Department of Curriculum and Instruction.

Voight, D. (1992). An assessment of the educational delivery systems employed by commercial field agronomists in publicly and privately owned cooperatives. Unpublished master's thesis. Ames: Iowa State University.

Wilson, C. (1991). Trends in distance education: A viable alternative for higher education. (ERIC Document Reproduction Service No. ED 337 081).

DISTANCE EDUCATION IN AGRICULTURE: TEACHING AND LEARNING THROUGH VIDEOTAPE

A Critique

John D. Parmley, Kansas State University - Discussant

Theoretical Framework - The authors have provided an adequate and appropriate discussion of literature related to their research. The identification of purpose and objectives seems to flow from this discussion.

Methodology - The methodology seems appropriate for the study and adequately described for reader understanding.

Findings, Conclusions and Recommendations - While the authors' study addressed a distance education strategy employed by a College of Agriculture, the interest in distance education strategies seems to be relevant to most areas of education. Thus, the authors' work will contribute to the specific audience address in the study as well as the more general discussion currently being conducted.

A CONCEPTUAL MODEL FOR EFFECTIVELY PLANNING AND DELIVERING DISTANCE EDUCATION COURSES AND PROGRAMS IN AGRICULTURE

Gary B. Jackson
Assistant Professor
Ag Education & Experimental Statistics
Mississippi State University

Blannie E. Bowen
C. Lee Rumberger Professor of Agriculture
Agricultural and Extension Education
The Pennsylvania State University

Introduction

During the past decade, American public education has witnessed an explosion of alternative systems for delivering instruction. According to the School Tech News (1986), distance learning projects that utilize telecommunications technologies have provided all educational levels (higher, secondary, and elementary) with opportunities to expand their course and program offerings. Education in this context means telecommunicated delivery of instruction from a classroom site to distant sites that are coupled with live audio and/or video interaction between the teacher and the students (Paulsen, 1987).

Distance education has become an emerging force because of the (1) growing demand for educational opportunities targeted to specific groups, (2) a societal shift from mass production to individualized instruction, and (3) recent advancements in communications technology (Lauzon & Moore, 1989). Colleges of agricultural sciences and organizations such as the Extension Service of the U. S. Department of Agriculture (ES/USDA) are attempting to find various avenues to deliver courses and programs to their clientele. According to Hamilton (1989), the Iowa Cooperative Extension Service installed distance education equipment in 1986 to link extension audiences in all Iowa counties. He indicated that the system has been effective in delivering educational programs to the citizens of Iowa. Hamilton found that favorable indicators for distance education included the effective use of small groups, travel savings (for staff), and the use of visual subject matter.

New avenues for delivering instructional programs can help meet the educational and informational needs of contemporary society while justifying the existence of many agricultural institutions, organizations, courses, and programs. Distance education can be one of those avenues in higher education. However, agricultural distance education will be successful only if college faculty, extension educators, and other professionals are dedicated to planning and delivering effective courses and programs. Newcomb (1992) indicated that agricultural distance education will not reach its potential until educators learn to plan and deliver instruction differently, using a variety of methods and techniques. When planning to utilize telecommunications technology within an existing organizational structure, faculty, extension educators, and other professionals need a development model with the necessary components, processes, and anticipated outcomes required to effectively plan and deliver distance education courses and programs.

Purpose and Objectives of the Study

The purpose of this study was to develop a conceptual model to enable college of agriculture faculty, extension educators, and other professionals to effectively plan and deliver agricultural distance education courses and programs. The objectives, which focused on the constructs included in the model, were to:

1. Identify incentives that encourage faculty, extension educators, and other professionals to effectively plan and deliver agricultural distance education courses and programs.

2. Identify barriers that inhibit the planning and delivery of agricultural distance education courses and programs.

3. Identify important instructional behaviors related to effectively planning agricultural distance education courses and programs.

4. Identify important instructional behaviors related to effectively delivering agricultural distance education courses and programs.

Research Procedures

The population for the study consisted of 15 college of agricultural sciences faculty and 150 extension educators from 42 universities who have planned and delivered televised credit and non-credit distance education courses and programs via the Agricultural Satellite Corporation (AG*SAT) network. The researchers and a jury of experts purposively selected 20 agricultural distance educators from a list supplied by AG*SAT. Nineteen of 20 selected panelists responded to both rounds of the study, which included 10 agricultural faculty who had planned and delivered an *agricultural credit course* via satellite and nine extension educators who had planned and delivered an *extension program* via satellite.

A modified Delphi approach was used to refine and narrow the data in that the initial list of barriers and behaviors was developed from related literature. Data were collected via two mailed questionnaires over a period of three months in 1993. In Round #1, the panel of experts responded to the first questionnaire that included: (1) open-ended questions related to the demographic characteristics of the panelists, (2) open-ended questions related to incentives that encourage agricultural faculty, extension educators, and other professionals to become involved in planning and delivering distance education courses and programs, (3) potential barriers encountered during the planning and delivery stages, and (4) behaviors related to the planning and delivery stages of an agricultural distance education courses or program. In Round #2, the panel of experts ranked 20 incentives related to why agricultural faculty, extension educators and other professionals plan and deliver distance education courses and programs, which they had previously listed on Questionnaire #1. They also reevaluated those potential barriers and planning and delivery behaviors that did not receive a consensus rating in Round #1. Data derived from both questionnaires were analyzed using the frequency distributions of the rated statements. Consensus was determined by placing the five point Likert-type scale ratings into 'high' (rating of 4 or 5) and 'low' (rating of 1 or 2) categories. Those items where 53% or more of the panelists selected a 'high' or 'low' categorical rating were determined to be a consensus because it represented a majority of the respondents.

Findings

The panelists' present university position or rank included 13 professors, three associate professors, two assistant professors, and one extension faculty member. The panel consisted of 17 males and two females. Sixteen of the panel members had a Ph.D. while three members held a master's degree. The mean years of professional experience was 19.5 years and the mean age of the panelists was 46.8 years. Panel members indicated that they have delivered an average of 3.7 hours of credit course instruction and 6.5 hours of noncredit programming via satellite during their professional career. These credit and noncredit hours consisted of a variety of courses and programs delivered via state and national telecommunications networks.

The panel of experts identified five incentives that encouraged them to plan and deliver an agricultural distance education course or program that includes: (1) additional use of the instructional materials other than for the course or program that is delivered via satellite, (2) the delivery of instruction more efficiently, (3) an efficient way for me to reach larger audiences, (4) provides an opportunity to increase public interest in a topic, and (5) efficiently meet public requests for information. They further indicated that the most important incentive was "an efficient way to reach larger audiences."

Panelists also identified six incentives that they believe will encourage other agricultural faculty, extension educators, and professionals to get involved in planning and delivering distance education courses and programs using satellite technology: (1) recognition from administrators, peers, clientele, etc., (2) availability of funds to produce courses, (3) opportunities to reach more people, (4) widespread demand shown for a particular topic, (5) adequate support staff to produce courses, and (6) the time to plan and deliver a course or program. The opportunity to reach more people and widespread interest in a particular topic were the most important incentives.

Obtaining funding and acquiring the necessary time needed to plan and deliver an agricultural distance education course or program were identified as barriers to the overall effectiveness of courses and programs that have been provided by the panelists.

Panel members indicated 21 *planning* behaviors were important to effectively planning distance education courses and programs that included preparing visual aids, selecting new and up-to-date materials, developing course or program objectives, identifying the subject matter content, and allocating instructional preparation time.

The panelists also indicated a high *ability to perform* 16 of the initial 21 planning behaviors. These items included identifying the subject matter content, developing course or program objectives, determine delivery methods, and becoming familiar with the telecommunications equipment to be used. The panelists did not reach a consensus on developing problem-solving situations for the participants and evaluation procedures for the course or program.

The panel of experts indicated that 29 of 32 items were important to the effective delivery of an agricultural distance education course or program. The most important behaviors included stating the purpose of the course or program, providing a course or program outline, sequencing instruction, determining the knowledge and skill level of the participants, providing feedback, using remedial instruction, and applying participant ideas to the course or program. Panelists did not reach a consensus on the remaining three items related to effective delivery, which included the use of individual learning tasks, suggesting strategies to improve study skills, and corresponding with participants through occasional face-to-face meetings while delivering a course or program via satellite.

The panel indicated a high *ability to perform* 24 of the initial 32 delivery behaviors, which included determining needs relative to the subject matter or program content, providing a variety of learning activities, applying participant ideas to the course or program, and occasionally corresponding with the participants during course or program transmission. They did not reach a consensus on five items that included: (1) using individual learning tasks, (2) promoting class or program discussion, (3) immediately reinforcing participant achievement, (4) providing remedial instruction when needed, and (5) using group learning tasks when delivering an agricultural distance education course and program via satellite. They also have a 'very low' (rating of 1) ability to suggest strategies to improve the study skills of the course or program participants.

A Conceptual Model

Dillon (1989) indicated that faculty participation in distance education will continue to be limited because of lack of incentive, poor attitudes toward distance education, suspicions of the nontraditional, threats to the traditional, and required changes in instructional methods. However, the potential for agricultural instruction and programming through distance education is tremendous. Newcomb (1992) indicated that technology is ready; however, agricultural distance education will not reach its potential until faculty, extension educators and other professionals are as ready as the technology. Research related to effectively planning and delivering agricultural distance education courses and programs, which includes identifying incentives and potential barriers, has been limited. Agricultural distance educators do not have a developmental model that will enable them to effectively plan and deliver agricultural distance education courses and programs. Therefore, based on the findings of this study, the researcher has developed a model to provide agricultural faculty, extension educators and other professionals with the necessary components, process, and product required for successfully planning and delivering a distance education course or program.

The components of the model are: (1) incentives that will encourage agricultural faculty, extension educators, and other professionals to become involved in distance education, (2) planning behaviors required for effectively preparing, organizing and coordinating the course or program to be provided, and (3) delivery behaviors required for successful implementation of the course or program.

Agricultural distance educators require certain incentives that are crucial to effectively planning and delivering courses and programs. These incentives must be present if agricultural faculty, extension educators and other professionals become involved in planning and delivering a distance education course or program. The incentives identified in this study have been divided into two categories: actual inputs required and anticipated outcomes. The actual inputs required are those incentives that are necessary to begin the course or program planning process, which should be supplied by educational institutions and public demand. The anticipated outcomes are those incentives that are 'rewards' from effectively planning and delivering a course or program. These incentives should eliminate the potential barriers related to effectively planning and delivering agricultural distance education courses and programs, which include obtaining the necessary funding and required time to produce a course or program.

The second and third components of the model consist of those *important* planning and delivery behaviors that were identified in the study. According to agricultural distance educators, these behaviors confront issues involved with effectively preparing and implementing a distance education course or program, which support Kelly's (1990) argument related to making a transition from resident education to education at a distance. Findings also indicate that these planning and delivery behaviors are necessary for providing the course or program participants with valid and useful information that promotes learning. These identified behaviors also support Schieman's (1990) summarization of several models used to plan and deliver distance education courses and programs.

The implementation of the model requires that educational administrators, promotion and tenure committees, agricultural businesses and corporations and other professional agencies and organizations provide the necessary incentives needed to encourage agricultural faculty, extension educators, and other professionals to plan and deliver distance education courses and programs. A team of instructional designers and telecommunications specialists (support staff) should also provide the necessary expertise required to effectively plan and deliver a course or program. However, the overall effectiveness of the model process rests with the course instructor or program coordinator who eventually performs each planning and delivery behavior within the appropriate phase. The agricultural faculty, extension educator, or other professional must develop a high ability to perform each behavior to achieve overall effectiveness.

Based on the findings of this study, agricultural faculty, extension educators and other professionals have a high ability to perform 16 of the *planning* behaviors in the model. However, special emphasis should be given to developing the five remaining planning behaviors. These are allocating instructional preparation time, planning for time constraints, identifying the prior knowledge and skill levels of the participants, developing evaluation procedures, and developing problem-solving situations for the participants. Behaviors found in the planning phase were also cited in a study by Wolcott (1993) that included developing a course or program syllabus and emphasizing content rather that process.

Agricultural faculty and extension educators also have a high ability to perform 24 *delivery* behaviors. Special emphasization should be given to developing the following delivery behaviors that are: (1) promoting class or program discussion, (2) immediately reinforcing participant achievement, (3) providing remedial instruction when needed, (4) using group learning tasks when delivering an agricultural distance education course and program via satellite, (5) determining participant needs relative to the subject matter, (6) using various approaches to evaluate delivery, and (7) using individual learning tasks.

The product follows the development phases for effectively planning and delivering agricultural distance education courses and programs. The product is comprised of effective delivery of instruction and dissemination of information, opportunity of reaching larger audiences, recognition, and increasing the public's interest in a particular topic.

Figure 1 identifies the complete model and its components, process, and product. Agricultural faculty, extension educators and other professionals who utilize this model would be more competent in planning and delivering effective distance education courses and programs. They would also have a clear understanding and perspective of the role of an agricultural distance educator, the values that define effective planning and delivery of distance education programming, and the way to more efficiently address the needs of contemporary society.

Newcomb (1992) indicated that agricultural departments must include the option of sharing their courses and programs among institutions via satellite delivery of instruction. DeLoughry (1992) also indicated in The Chronicle of Higher Education that university and college administrators are being urged by various groups to help expand the use of technology on college campuses. With this rapidly changing technology, educators will be expected to disseminate extensive amounts of information being produced. They will also be expected to expand their resident classrooms and information centers to larger and more diverse audiences. This model is designed to provide the necessary guidance and knowledge needed to successfully plan and deliver an agricultural distance education course or program.

Recommendations

Based on the study's findings and conclusions, the following recommendations are made:

1. Colleges of the agricultural sciences should establish an institutional support system with specific policies, procedures, and structures to help faculty and extension educators plan and deliver quality distance education courses and programs.

2. Colleges of the agricultural sciences should provide faculty and extension educators with the necessary funding and time required to effectively plan and deliver distance education courses and programs.

3. Colleges of the agricultural sciences should establish selected incentives that will encourage faculty and extension educators to effectively plan an deliver distance education courses and programs.

4. Further research should be conducted to test the development model for effectively planning and delivering agricultural distance education courses and programs.

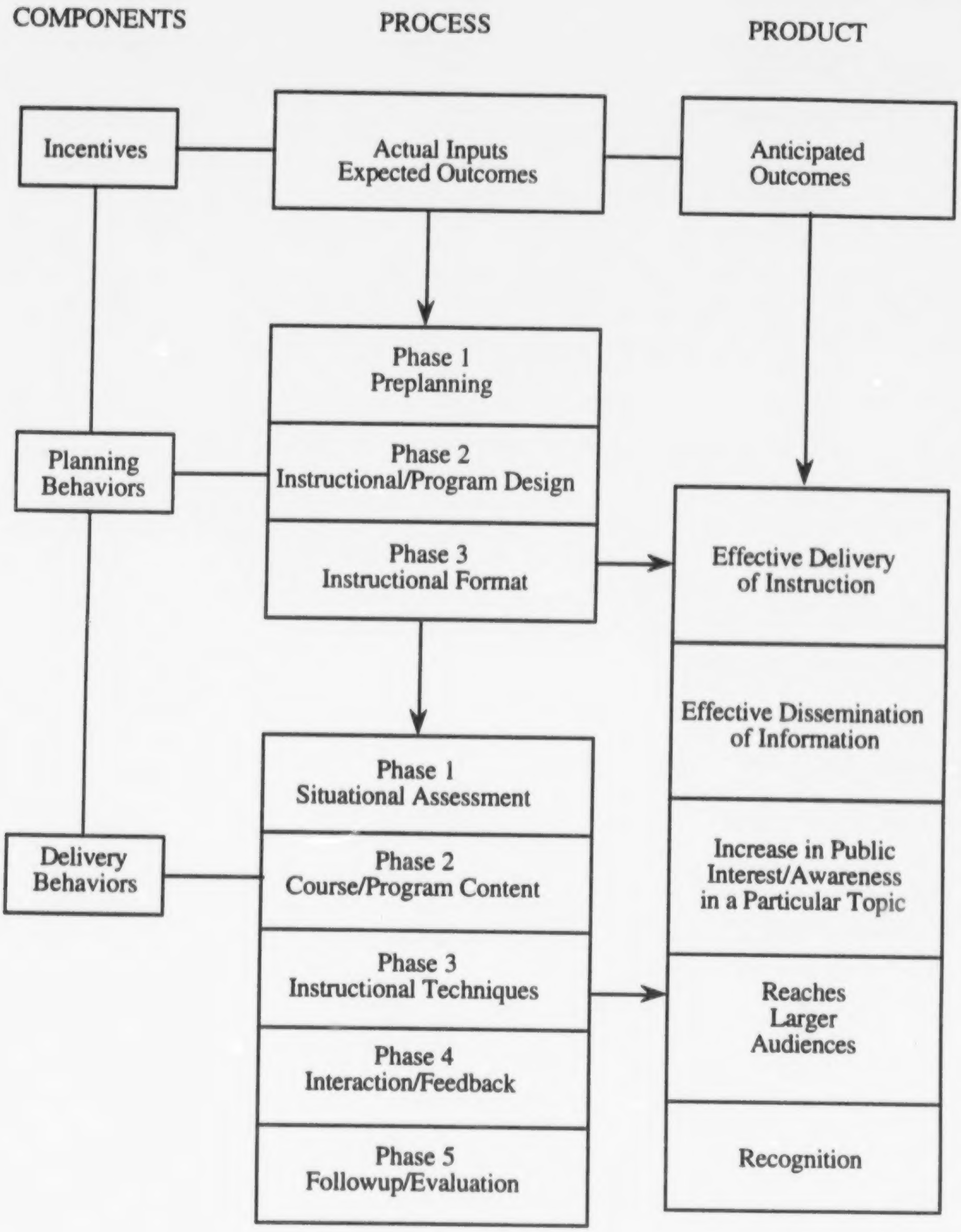

COMPONENTS
PROCESS
PRODUCT
Incentives
Actual Inputs
Expected Outcomes
Anticipated
Outcomes
Phase 1
Preplanning
Phase 2
Instructional/Program Design
Phase 3
Instructional Format
Planning
Behaviors
Effective Delivery
of Instruction
Effective Dissemination
of Information
Phase 1
Situational Assessment
Phase 2
Course/Program Content
Delivery
Behaviors
Increase in Public
Interest/Awareness
in a Particular Topic
Phase 3
Instructional Techniques
Reaches
Larger
Audiences
Phase 4
Interaction/Feedback
Phase 5
Followup/Evaluation
Recognition

Figure 1
A Conceptual Model for Effectively Planning and Delivering Distance Education Courses and Programs in Agriculture.

References

Agricultural Satellite Corporation. (1990). The Agricultural Satellite Corporation/ AGSAT. Lincoln: Nebraska Educational Telecommunications Center.

DeLoughry, T. J. (1992, October). Presidents urged to help expand use of technology on campuses. The Chronicle of Higher Education, 38(52), A19-20.

Dillon, C. (1989). Faculty rewards and instructional telecommunications: A view from the telecourse faculty. The American Journal of Distance Education, 3(2), 35-43.

Hamilton, J. (1989). Using satellite technology for education program delivery in Iowa. The American Journal of Distance Education, 3(1), 61-63.

Kelly, M. (1990). Course creation issues in distance education. In D. R. Garrison & D. Shale (Eds.), Education at a distance: From issues to practice (pp. 77-99). Malabar, FL: Robert E. Krieger Publishing Company.

Lauzon, A. C. & Moore, G. A. B. (1989). A fourth generation distance education system: Integrating computer-assisted learning and computer conferencing. The American Journal of Distance Education, 3(1), 38-49.

Newcomb, L. H. (1992). Satellite television technology is ready for us; Are we ready for it? Downlink, 1(1), 2.

Newcomb, L. H. (1992). Transforming university programs of agricultural education. Distinguished Lecturer Paper presented at the American Association of Agricultural Educators Meeting, St. Louis, MO.

Paulsen, M. F. (1987). In search of a virtual school. T.H.E. Journal, 15(5), 74-76.

Schieman, E. (1990). Instructional development concerns. In D. R. Garrison & D. Shale (Eds.), Education at a distance: From issues to practice (pp. 67-76). Malabar, FL: Robert E. Krieger Publishing Company.

School Tech News. (1986). Distance learning seen sweeping country. 3(7), 1-5.

Wolcott, L. L. (1991). A qualitative study of teachers' planning of instruction for adult learners in a telecommunications-based distance education environment. Proceedings of Selected Research Presentations at the Annual Convention of the Association for Educational Communications and Technology. (ERIC Doc. ED 335023).

A CONCEPTUAL MODEL FOR EFFECTIVELY PLANNING AND DELIVERING DISTANCE EDUCATION COURSES AND PROGRAMS IN AGRICULTURE

A Critique

John D. Parmley, Kansas State University - Discussant

Theoretical Framework - The authors are to be commended for their efforts to provide a conceptual model for planning and delivering distance education. By developing a model, the authors have not only identified related research but have woven previously existing literature with findings from their work to establish a theoretical framework for others to consider.

Methodology - The research procedures were appropriate and adequately described. The use of agricultural distance educators from across the country added to the strength of the research design.

Findings, Conclusions and Recommendations - The authors' provided a summary of their research and the subsequent synthesis of data into their conceptual model. The clear written description of the model is enhanced by a graphic representation. Finally, the authors conclude their paper by relating their work to other contemporary investigations.

THE EXTENT STUDENT TEACHERS UTILIZED THE PROBLEM-SOLVING APPROACH TO TEACHING DURING THE STUDENT TEACHING PRACTICUM

Bryan L. Garton
Assistant Professor
Agricultural Education
University of Missouri

Jamie Cano
Associate Professor
Agricultural Education
The Ohio State University

Introduction

The problem-solving approach to teaching has had a long history in the agricultural education profession (Moore & Moore, 1984; Lass & Moss, 1987; Herren, 1987). Dickerson (1984) maintained that "the problem-solving approach to teaching has become almost synonymous with agricultural education" (p. 6). Crunkilton (1988) concluded that "... problem solving, both as a method of teaching and as a skill that students need, is more critical today than it was years ago" (p. 8).

The agricultural education profession has placed an emphasis on teaching secondary agriculture students decision making skills through problem-solving (American Association for Agricultural Education, Preparation of Professionals for Agricultural Education, 1991). Furthermore, teacher educators (Association of Teacher Educators, Commission on the Education of Teachers, 1991) across subject matter disciplines support teaching teachers how to teach using problem-solving. However, to what extent have teachers of agriculture been utilizing the problem-solving approach to teaching?

Research (Boone, 1988; Osborne & Hamzah, 1989) found that teachers of agriculture organized their lessons on a problem-solving basis, but did not follow through with actual problem-solving teaching in the classroom. Boone and Newcomb (1990) concluded that the teachers could not distinguish between teaching with the problem-solving approach or subject matter approach to teaching. Furthermore, teachers who were utilizing the problem-solving approach to teaching were not fully employing all essential elements of the problem-solving approach to teaching (Boone & Newcomb, 1990).

With regard to the student teaching practicum, McKee & Warmbrod (1992) concluded that student teachers were not fully utilizing the problem-solving approach to teaching. Osborne and Hamzah (1989) concluded that teachers used problem-solving more in their teaching if it was used during student teaching and was encouraged throughout the teacher preparation program.

Crunkilton (1988) stated that agricultural education needed research in the area of teaching methodology so that teacher educators could better prepare teachers of agriculture. Subsequently, with the emphasis placed on teaching utilizing problem-solving, the question arises as to what extent do teachers of agriculture teach using the problem-solving approach? Furthermore, what teaching methods are teachers of agriculture utilizing?

Purpose and Objectives

The purpose of the study was to describe the extent student teachers used the problem-solving approach to teaching during the student teaching practicum. The study further sought to describe the teaching methods utilized by student teachers, while using and not using the problem-solving approach to teaching. The study was guided by the following objectives:

1. Describe the extent student teachers utilized the problem-solving approach to teaching during the student teaching practicum.

2. Describe the teaching methods utilized by student teachers, while using the problem-solving approach to teaching during the student teaching practicum.

3. Describe the teaching methods utilized by student teachers, while not using the problem-solving approach to teaching during the student teaching practicum.

Procedures

The target population for the descriptive study was preservice teachers majoring in agricultural education at The Ohio State University. The accessible sample was preservice agriculture teachers enrolled in the student teaching practicum at The Ohio State University during the Autumn Quarter, 1992 (n = 15). Therefore, caution should be exercised when generalizing the results of the study beyond the accessible sample.

All student teachers had completed a methods of teaching agriculture course that emphasized the use of the problem-solving approach to teaching. Furthermore, the student teachers had the opportunity to utilize the problem-solving approach to teaching in eight microteaching practicums that ranged from 15 to 30 minutes in length.

The Extent Of Use Of The Problem-Solving Approach To Teaching and The Utilization of Teaching Methods Inventory (Garton & Cano, 1992) was used to describe the extent that student teachers utilized the problem-solving approach to teaching. The instrument consisted of 10 procedures that represented a teacher's extent of use of the problem-solving approach to teaching. In addition, the instrument identified teaching methods utilized in the teaching/learning process, either while using the problem-solving approach to teaching, or while not using the problem-solving approach to teaching.

The instrument was assessed for validity by a panel of teacher educators who were considered to be knowledgeable on the problem-solving approach to teaching. Reliability of the instrument was established by assessing the intra-rater reliability. Ten randomly selected microteaching videotapes from the methods of teaching agriculture course were analyzed, followed by a reanalysis 14 days later. The resulting coefficients of stability for the 10 problem-solving approach to teaching procedures ranged from .90 to .99. The coefficient of stability for the total score on the problem-solving approach to teaching was .99.

To describe the extent that the problem-solving approach to teaching was utilized during the student teaching practicum, student teachers were requested to videotape three periods of their "classroom" teaching. Student teachers were provided with specific videotaping directions and were requested to videotape one class period of their "classroom" teaching during the third, sixth, and ninth weeks of the student teaching practicum.

Analysis of Data

At the conclusion of the student teaching practicum, videotapes from the student teachers were analyzed using the Extent Of Use Of The Problem-Solving Approach To Teaching and The Utilization Of Teaching Methods Inventory. All data were analyzed and descriptive statistics calculated utilizing the SPSS/PC+ computer program.

Results

Student teachers spent, on the average, 18% of their instructional time utilizing the problem-solving approach to teaching during the three observations of "classroom" teaching (Table 1). The extent student teachers' utilized the problem-solving approach to teaching ranged from zero to 75%, with a standard deviation of 20.9.

Table 1
Percentage of Instructional Time Spent Using the Problem-Solving Approach To Teaching
(n = 15)

Problem-Solving Procedures	Mean	S.D.	Range
1. Teacher was gaining and maintaining the interest of the students in learning the subject matter.	2.9	4.7	.0 - 15.6
2. Teacher and students were organizing instruction around solvable problem statements.	.0	.0	.0 - .0
3. Teacher was leading students in defining a clear statement of the problem.	1.0	1.5	.0 - 4.7
4. Teacher was drawing possible solutions to the problem from the students.	.6	1.6	.0 - 5.5
5. Teacher was leading students in discovering the factors needed to be considered in exploring a possible solution to the problem.	.8	1.4	.0 - 4.7
6. Teacher was guiding students in seeking data and information needed to analyze potential solutions to the problem.	7.4	9.3	.0 - 26.6
7. Teacher was assisting students in analyzing the data and information to determine a solution to the problem.	4.0	7.9	.0 - 26.6
8. Teacher was leading students in arriving at a tentative conclusion and/or recommendation to the problem.	.4	1.2	.0 - 4.5
9. Teacher was guiding students in applying the solutions and/or recommendations to the problem.	.0	.0	.0 - .0
10. Teacher was leading students in evaluating the results of the solution to the problem.	.6	2.0	.0 - 7.8
Total score for the problem-solving approach to teaching.	17.6	20.9	.0 - 75.0

With regard to the 10 problem-solving approach to teaching procedures, student teachers spent the greatest amount of time in "guiding students in seeking data and information needed to analyze potential solutions to the problem" (mean = 7.4) and "assisting students in analyzing the data and information to determine a solution to the problem" (mean = 4.0). Student teachers spent no time utilizing the procedures "organizing instruction around solvable problem statements" and "guiding students in applying the solutions and/or recommendations to the problem."

While using the problem-solving approach to teaching, student teachers spent, on the average, 12% of the total instructional time on "lecture/discussion" and 5% utilizing the "supervised study" methods of teaching (Table 2). Student teachers spent no time utilizing the teaching methods of "demonstration," "experiment," and "role play," while using the problem-solving approach to teaching. Furthermore, student teachers exhibited no "idle time" while using the problem-solving approach to teaching.

When not utilizing the problem-solving approach to teaching, student teachers spent the greatest amount of instructional time utilizing the "lecture/discussion" teaching method (mean = 60.8) (Table 3). Student teachers spent the least amount of instructional time utilizing the "experiment" teaching method (mean = 1.3). In addition, student teachers utilized the "demonstration," "supervised study," and "role play" methods of teaching. Furthermore, student teachers spent, on the average, three percent of their instructional time in the category of "idle time" while not using the problem-solving approach to teaching.

Table 2
Percentage of Instructional Time of the Teaching Methods Utilized While Using the Problem-Solving Approach To Teaching (n = 15)

Teaching Methods	Mean	S.D.	Range
Lecture/Discussion	11.6	13.7	.0 - 48.4
Demonstration	.0	.0	.0 - .0
Experiment	.0	.0	.0 - .0
Supervised Study	6.0	8.3	.0 - 26.6
Role Play	.0	.0	.0 - .0
Other	.0	.0	.0 - .0
Idle Time	.0	.0	.0 - .0

Table 3
Percentage of Instructional Time of the Teaching Methods Utilized While Not Using the Problem-Solving Approach To Teaching (n = 15)

Teaching Methods	Mean	S.D.	Range
Lecture/Discussion	60.8	21.5	14.8 - 100.0
Demonstration	2.6	7.1	.0 - 24.4
Experiment	1.3	2.4	.0 - 6.9
Supervised Study	8.3	6.3	.0 - 19.8
Role Play	1.8	5.3	.0 - 19.5
Other[a]	5.0	6.8	.0 - 20.6
Idle Time	2.5	3.7	.0 - 14.8

[a] Quiz, Game/Contest, Reciting FFA Creed

Conclusions and Recommendations

In preparation for the student teaching practicum, the student teachers completed a teaching methods course which emphasized the problem-solving approach to teaching. However, it can be concluded that the student teachers spent less that one fifth of their instructional time utilizing the problem-solving approach to teaching during the student teaching practicum. A further conclusion is that some student teachers did not utilize the problem-solving approach to teaching while other student teachers utilized the approach nearly 75% of the time during the student teaching practicum.

While utilizing the problem-solving approach to teaching, student teachers spent the greatest amount of time guiding students in seeking data and information and analyzing the data and information. A further conclusion is that the student teachers did not teach students how to apply solutions and/or recommendations to the problems solved during their "classroom" instruction.

Student teachers utilized only the "lecture/discussion" and "supervised study" teaching methods while using the problem-solving approach to teaching. Can the use of only two teaching methods be considered enough variability in teaching the subject content? Research (Rosenshine & Furst, 1971) has found that effective teachers utilized a variety of teaching methods to teach the subject content. Furthermore, a variety of teaching methods have been identified for teachers of agriculture and students to use during the problem-solving approach to teaching (Phipps & Osborne, 1988; Crunkilton & Krebs, 1982; Newcomb, McCracken, & Warmbrod, 1986).

The variability of teaching methods increased when student teachers were not using the problem-solving approach to teaching. Student teachers utilized six teaching methods while not using the problem-solving approach to teaching compared to two teaching methods while using the problem-solving approach to teaching. However, "lecture/discussion" was the most utilized teaching method while either using or not using the problem-solving approach to teaching.

Preservice teachers of agriculture must be exposed to and taught how to utilize the problem-solving approach to teaching in more than one preservice teacher education course. It is dubious to expect a change in the teaching and learning behaviors of preservice teachers based on the outcomes of one course. Therefore, it is recommended that teacher educators incorporate the problem-solving approach to teaching in other professional courses in the teacher preparation program.

Additional instructional time should be spent in the preservice teacher preparation program with regard to teaching preservice teachers how to teach students to apply solutions and/or recommendations to problems solved. Preservice teachers should be provided with clinical laboratory experiences in teaching students to apply the solutions and/or recommendations to the problem(s) under investigation.

Some student teachers did not utilize the problem-solving approach to teaching during the student teaching practicum while other student teachers utilized the approach nearly 75% of the "classroom' instructional time. Future research should focus on identifying factors which influence student teachers' use of the problem-solving approach to teaching.

Student teachers utilized relatively few teaching methods whether or not they taught using the problem-solving approach. Student teachers were utilizing the "lecture/discussion" method of teaching in excess of 70% of the "classroom" instructional time. The question which could be raised is: "Why were student teachers relying so heavily on the use of one teaching method in their "classroom" teaching?" Consequently, future research should focus on factors related to the selection of teaching methods employed by student teachers as a function of using the problem-solving approach to teaching.

The agricultural education profession has professed the use of the problem-solving approach to teaching. Therefore, the profession should assess the extent teachers of agriculture utilize the problem-solving approach to teaching on a continual basis. A longitudinal study with student teachers on the extent of use of the problem-solving approach to teaching should be undertaken. The longitudinal study should begin with the current study and continue with student teachers in subsequent student teaching practicums. In addition, a longitudinal study should be conducted that follows teachers from their student teaching practicum through the first five years of teaching with regard to the extent of use of the problem-solving approach to teaching and the teaching methods utilized. Furthermore, research should be conducted with all teachers of agriculture in the current state, and other states, to assess the extent that the problem-solving approach to teaching is being utilized in the agricultural education profession.

References

American Association for Agricultural Education. (1991). Preparation of Professionals for Agricultural Education. Committee report presented at the meeting of the American Association for Agricultural Education, Los Angeles, CA.

Association of Teacher Educators, Commission on the Education of Teachers. (1991). Restructuring the education of teachers: Commission on the education of teachers into the 21st century. Reston, VA: Association of Teacher Educators.

Boone, H. N. (1988). Effects of approach to teaching on student achievement, retention, and attitude. Unpublished doctoral dissertation, Columbus: The Ohio State University, Department of Agricultural Education.

Boone, H. N., & Newcomb, L. H. (1990). Effects of approach to teaching on student achievement, retention and attitude. Journal of Agricultural Education, 31(4), 9-14.

Crunkilton, J. R. (1988). Thinking out loud about this process we call teaching. The Journal of the American Association of Teacher Educators in Agriculture, 29(1), 2-10.

Crunkilton, J. R. & Krebs, A. R. (1982). Teaching agriculture through problem solving. Danville, IL: The Interstate Printers and Publishers.

Dickerson, I. A. (1984). A reexamination of basics in agricultural education. Journal of the American Association of Teacher Educators in Agriculture, 25(1), 2-11.

Garton, B. L. & Cano, J. (1992). Extent of use of the problem-solving approach to teaching and the utilization of teaching methods inventory. Columbus: The Ohio State University, Department of Agricultural Education.

Herren, R. (1987). The problem solving approach: History and implications. Journal of Vocational and Technical Education, 4(1), 18-24.

Lass, C. B. & Moss, J. W. (1987). The evolution of the problem solving approach in agricultural education: A historical analysis. Paper presented at the National Agricultural Education Research Meeting, Las Vegas, NV.

McKee, S. R. & Warmbrod, J. R. (1992). The relationship between the use of problem-solving teaching during student teaching and the first-year of teaching. Proceedings of the Nineteenth Annual National Agricultural Education Research Meeting, St. Louis, MO.

Moore, G. E. & Moore, B. (1984). The problem solving approach to teaching: Has it outlived its usefulness? The Journal of the American Association of Teacher Educators in Agriculture, 25(2), 3-10.

Newcomb, L. H., McCracken, J. D., & Warmbrod, J. R. (1986). Methods of teaching agriculture. Danville, IL: The Interstate Printers and Publishers.

Osborne, E. W. & Hamzah, R. (1989). Use of problem solving teaching among secondary agriculture teachers in Illinois. The Journal of the American Association of Teacher Educators in Agriculture, 30(3), 29-36.

Phipps, L. J. & Osborne, E. W. (1988). Handbook on agricultural education in public schools. Danville, IL: The Interstate Printers and Publishers.

Rosenshine, B. & Furst, M. (1971). Research on teacher performance criteria. In B. O. Smith (Ed.), Research in teacher education (pp. 27-72). Englewood Cliffs, NJ: Prentice Hall.

THE EXTENT STUDENT TEACHERS UTILIZED THE PROBLEM-SOLVING APPROACH TO TEACHING DURING THE STUDENT TEACHING PRACTICUM

A Critique

John D. Parmley, Kansas State University - Discussant

Theoretical Framework - The authors provide a review and synthesis of contemporary literature related to the problem-solving approach to teaching. Since the problem-solving approach to teaching continues to be a major instructional strategy in the profession, the authors' investigation will make a valuable contribution to agricultural education's professional knowledge base.

Methodology - The research team utilized instrumentation which was previously developed and validated. A clear description of the validation process is included in the paper. The procedures employed during the study were clearly described and appropriate for the identified objectives.

Findings, Conclusions and Recommendations - The authors clearly describe what seems to be a dilemma as they found that the student teacher participants made somewhat limited use of the problem-solving approach to teaching, even though the agricultural education teaching profession considers the approach to be a highly effective instructional strategy. The recommendations offered by the authors seem to provide valuable considerations for those involved in teacher preparation.

NAERM Third Session
10:30 a.m.-12:00 noon
Concurrent Session F

Theme: Training Needs and Information Sources for Extension Education

Topic 1: An analysis of information sources used in dairy reproductive management

Speakers: Fawzia Sulaiman (Indonesia Ministry of Agriculture)
Connie Baggett, Ed Yoder (The Pennsylvania State University)

Topic 2: Training needs of area specialized extension agents in the North Carolina cooperative extension service

Speakers: Jerry Gibson (North Carolina Cooperative Extension Service)
John Hillison (Virginia Polytechnic Institute and State University

Topic 3: Development of an action research process to evaluate and implement a new vision in the Cornell cooperative extension 4-H youth development program

Speaker: Mhora Newsom-Stewart (Cornell University)

Topic 4: Relationships between occupations of home-based workers and demographic and work characteristics

Speakers: Marilyn Furry, Rama Radhakrishna (The Pennsylvania State University)

Discussant: Randol Waters (University of Tennessee)

Chairperson: Martin Frick (Purdue University)

Facilitator: Matthew Baker (California Polytechnic State University-Pomona)

AN ANALYSIS OF INFORMATION SOURCES USED IN DAIRY REPRODUCTIVE MANAGEMENT

Fawzia Sulaiman
Directorate General for Livestock Services
Ministry of Agriculture, Indonesia

Connie D. Baggett, Associate Professor
Edgar P. Yoder, Associate Professor
Department of Agricultural & Extension Education
The Pennsylvania State University

Conceptual Framework

To develop effective educational programming, agricultural communication and extension educators need to develop useful information and choose appropriate channels to reach the target audience. Information sources for a particular subject matter or an issue which the target audience rely on should also be considered in delivering the educational programs.

When farmers need particular information, each of them may have preferences regarding the information sources they are going to use. Farmers preference to seek information from particular sources are based on their perceived importance and confidence in the accuracy of information received (Kramic, 1987). In this respect, Iowa farmers considered cooperative extension, Soil Conservation Service (SCS), and the local seed and chemical/fertilizer dealers as the three most useful information sources for learning about soil conservation (Bruening, 1991). Kramic (1987) reported that farmers in Ohio perceived radio and television as the most important information sources for current market report when making production and marketing decisions. Further, Kramic indicated that the Ohio Cooperative Extension's bulletins and newsletters were perceived as the most important and accurate printed media for the same type of information. Peisher and Harrison (1992) reported that the characteristics of the clientele such as age, marital status, gender, education, and income were associated with the needs and sources about nutrition information they used. In the area of food safety, clientele preferred radio, television, and newspapers as information sources to learn about the issue (Gilmore, Meehan-Strub, & Mormann, 1992).

Besides the information channels used by the target audience, the information sources that resulted in a significant impact on the use of recommended practices should be considered in developing educational programs. Thus, this study was conducted to identify the perceptions of Pennsylvania milk producers regarding the frequency of receiving information about dairy reproductive management from various potential sources, and the perceived importance of each source. The second objective of the study was to determine information sources that were associated with the use of recommended reproductive management practices.

Methodology

A descriptive correlational survey was used in this study. The study covered five areas of dairy reproductive management suggested by Smith (1982), including reproductive health, feeding management, calving and postpartum management, heat detection, and artificial insemination (A.I.). Dairy reproductive management practices recommended by Sterner (1986) were modified and used for the study.

Selection of a Sample

The Pennsylvania Department of Agriculture, Bureau of Animal Industry assisted in identifying dairy farmers. The population included 12,247 Pennsylvania diary farmers. From this group, a random sample of 500 individuals were selected using a random number generator. The sample yielded a 95% level of confidence and a 3% sampling error (Krejcie & Morgan, 1970).

Instrumentation

An instrument was developed and reviewed for content validity by the northeast regional director, Penn State Cooperative Extension and 10 selected Penn State faculty members. The instrument covered five areas of dairy herd management and was pretested with farmers not later used in the study.

Dairy farmers were asked to rate their perceptions regarding the frequency of receiving information and the importance of 17 potential information sources. A Likert-type scale ranging from 1 (never) to 3 (frequently) was used to measure the respondents' perception regarding the frequency of receiving information from various potential sources. The dairy farmers' perceptions regarding the importance of each source was measured on the similar scale ranging from 1 (not important at all) to 4 (very important). Analysis of pretest data exhibited acceptable reliabilities for the sub-test and entire instrument (Cronbach's alpha coefficients ranged from .62 to 0.95).

Data Collection

The questionnaire accompanied by a cover letter and a return-addressed, postage-paid envelope was mailed to the respondents on February 24, 1992. A postcard reminder was sent three weeks after the first mailing to all respondents who had not returned their responses. A second mailing was sent five weeks after the first mailing. A response rate of 63.8% was obtained and 61.2% of the returned questionnaires were usable. A follow-up procedure suggested by Miller and Smith (1983) was used to test for possible differences and associations between respondents and non-respondents. Results of t-test and Chi-square analyses indicated no significant differences or associations between those two groups. Thus, the researchers concluded that results of this study can be generalized to the population.

Data Analysis

Means and standard deviations were calculated for the frequency of receiving information from potential sources and the perceived importance of each source. A multiple regression analysis was used to examine information sources that influenced the use of recommended practices in the five areas of reproductive management. Distributions and percentages were calculated for demographic information.

Findings

The average age and experience of dairy farmers were 43 years and 22 years, respectively. Over one-half of dairy farmers (56%) were high school graduates and 31% did not complete high school. Approximately 6% of respondents were college graduates or higher, and 7% held associate degree. A majority of dairy farmers (85%) used artificial insemination (A.I.) in their dairy operation, and only 13% of those A.I. users did not breed their heifers artificially. Over one-half of respondents (56%) reported membership in the Dairy Herd Improvement Association (DHIA), and 86% considered dairying as their primary source of income.

Objective 1

The frequency of information received from various sources and the perceived importance of each source are presented in Table 1. Farm or dairy magazines were the most frequent information sources received by dairy farmers, followed by farm newspapers, veterinarians, and A.I. organizations. Dairy farmers reported that they occasionally received information about reproductive management from other farmers, county extension agents, feed company representatives, and DHIA. However, veterinarians were perceived as the most important source of information, followed by farm or dairy magazines and A.I. organizations as the next most

Table 1. Means, Standard Deviations and Rankings for Receiving Information and Their Self-Perceived Importance for Each Source of Information about Dairy Reproductive Management.

Sources of Information	Frequency of Receiving Information[a]			Importance of Source of Information[b]		
	Mean	SD	Rank[c]	Mean	SD	Rank[c]
Farm or dairy magazines[d]	2.60	.56	1	2.90	.85	2
Farm newspapers[d]	2.40	.70	2	2.71	.93	4
Veterinarian[d]	2.32	.76	3	3.29	.91	1
A.I. organization personnel and/or publications[d]	2.30	.68	4	2.81	.93	3
Other farmers, and/or family members[d]	2.09	.61	5	2.57	.91	6
County extension agent[d]	2.05	.70	6	2.41	.82	7
Feed company representatives[d]	2.05	.70	7	2.64	.94	5
DHIA personnel and/or publications[d]	1.77	.79	8	2.29	1.07	8

[a] Scale: 1=never; 2=occasionally; 3=frequently

[b] Scale: 1=not important at all; 2=somewhat important; 3=important ; 4=very important

[c] Ranks are based on the mean values

[d] Information source that potentially receives information from cooperative extension

important sources of information. There was no great discrepancy observed between the frequency of receiving information from the potential sources and the perceived importance of each source (Table 1).

The respondents were also asked to indicate the most importance of sources of information used in making decisions about reproductive management. Table 2 presents this data. These data were similar to that reported in Table 1. Even though dairy farmers rated farm newspapers as fourth in its importance, results of the frequency analysis indicated that only 0.8% of the respondents reported using farm newspapers to make decisions about reproductive management. County extension agents were rated seventh in their importance as a source of information about reproductive management, but they were ranked fifth as the most important source of information in making decisions about reproductive management. Furthermore, DHIA was ranked fourth as the most important source of information in making decisions about reproductive management, even though it was rated eighth (Table 1) in its importance as a source of information. The lower rating of DHIA in its importance may be caused by fact that only 56% of dairy farmers were members of the organization. In this respect, the respondents' perceptions regarding the most important source of information used in making decisions about reproductive management is a better indicator of the perceived importance of the information sources. Kramic (1987) asserted that when farmers perceived certain sources of information as being important, they were also confident in the accuracy of information received from those sources.

Table 2. Self-Perceived Most Important Sources of Information Utilized by Dairy Farmers in Making Decisions about Reproductive Management.

Source of Information	n	Percent	Rank[a]
Veterinarians[b]	158	62.0	1
Farm or dairy magazines[b]	27	10.6	2
A.I. organizations[b]	26	10.2	3
DHIA[b]	10	3.9	4
County extension agents[b]	9	3.5	5
Feed company personnel[b]	9	3.5	5
Other farmers[b]	8	3.1	6

[a] Ranks are based on the mean values

[b] Information source that potentially receives information from cooperative extension

Objective 2

Results of the final multiple regression analyses for objective two indicated that four information sources were related significantly to the use of three of five reproductive management areas. Those were recommended practices in reproductive herd health, feeding management, and heat detection (Table 3). Results of the frequency analysis showed that 21% of respondents never received information about reproductive management from extension in the last 12 month, 48% and 26% of respondents occasionally and frequently received information, respectively, from cooperative extension. Moreover, county extension agents were rated as seventh in its importance as a source of information, and 3.5% of dairy farmers perceived the agents was the most important source utilized in making decisions about reproductive management. On the other hand, feed company personnel was rated fifth in their importance as a source of information, and 3.5% of respondents reported using information received from feed company personnel in making decisions about reproductive management. The percentages of dairy farmers who indicated never, occasionally and frequently received information from feed company personnel were 21%, 47% and 26%, respectively. Furthermore, veterinarians were rated third regarding the frequency of information received from this source, but they were ranked as first in its importance, and 62% of dairy farmers perceived veterinarians as the most important source of information utilized in making decisions about reproductive management. However, information received from cooperative extension was related significantly ($p< .012$) to the use of recommended practices in heat detection.

Most information from extension can be obtained free of charge or only for relatively small financial obligation. However, dairy farmers need an active effort to obtain information from cooperative extension. In this respect, it may not only be the credibility of the information source that influence its perceived importance, but also the financial consequences and accessibility in obtaining the information. Results of a chi-square analysis comparing dairy farmers who never received information from cooperative extension with those who occasionally or frequently received information from cooperative extension are presented in Table 3. Information from cooperative extension was defined as information received from county extension agents, university printed materials, extension educational programs, and from university extension specialists. The frequency of information received from farm or dairy magazines (phi = .14), other farmers (phi = .14), and from DHIA (phi = .19) had significant, although low, relationships with the dairy farmers' frequency of receiving information from cooperative extension. This finding

Table 3. Chi-square Results Comparing the Frequency of Receiving Information from Extension on the Frequency of Receiving Information from Other Sources of Information.

Variable	Frequency of Receiving Information from Extension: Never	Frequency of Receiving Information from Extension: Occasionally or Frequently	Chi-square	ϕ (Phi)
	-- % --	-- % --		
Frequency of receiving information from veterinarians			1.5935	.0746
Never	24.4	16.6		
Occasionally or frequently	75.6	83.4		
Frequency of receiving information from DHIA			10.9359	.1945**
Member of DHIA	33.3	59.3		
Non-member of DHIA	66.7	40.7		
Frequency of information from farm or dairy magazines			5.6875	.1410*
Never	52.3	33.5		
Occasionally or frequently	47.7	66.5		
Frequency of information from other farmers[a]			5.0921	.1356*
Never	26.2	12.8		
Occasionally or frequently	73.8	87.2		

[a] For the frequency of information received from other farmers, the correlation with never or occasionally and frequently received information from extension is reported.
* significant at .05 level; ** significant at .01 level

Table 4. Information Sources Influencing the Use of Reproductive Management Practices and Their Levels of Significance.

Independent Variable	Level of Significance: Reproductive Health	Level of Significance: Feeding	Level of Significance: Heat Detection
Information from extension	NS	NS	$p < .012$*
DHIA membership status	$p < .001$**	$p < .017$*	NS
Feed company personnel	NS	$p < .015$*	NS
Farm management consultant	NS	$p < .011$*	NS
Knowledge index	$p < .001$**	$p < .001$**	$p < .001$**

* significant at .05 level; ** significant at .01 level
NS: non-significant

implies that dairy farmers who receive more information from DHIA, farm or dairy magazines and from other farmers are also more likely to receive more information from extension. Dillman (1986) suggested that one of the Cooperative Extension' roles in the future should be as a peer information consultant to help its clientele to overcome information overload through devising means to get precise information needed by the clientele. Further, Dillman suggested that the main role of extension agents is as trustworthy and knowledgeable consultants.

Results of the final multiple regression analysis indicated that membership in the Dairy Herd Improvement Association (DHIA) had significant relationships with the use of recommended practices in reproductive herd health ($p < .001$) and feeding ($p < .017$). DHIA was rated as eight in its importance as a source of information (Table 1), but it was ranked as fourth as the most important source of information used in making decisions about reproductive management. The percentage of Pennsylvania dairy farmers who were members of DHIA was 56%.

Data in Tables 1 and 2 show that feed company personnel were perceived fifth in both of its importance as a source of information and as the most important source of information utilized in making decisions about reproductive management. This source of information was also related significantly ($p < .015$) to the use of recommended practices in feeding.

Results of the frequency analysis indicated that 65% of dairy farmers never received information from farm management consultants, and only 25% of respondents occasionally and 10% frequently received information from farm management consultants in the last 12 month. However, a final regression analysis resulted of a significant relationship ($p < .011$) between the frequency of receiving information from farm management consultants and the use of recommended practices in feeding. Results of the frequency analysis indicated that farm management consultants was ranked 13th in its importance as a source of information about reproductive management.

There were discrepancies observed between the perceived importance of each source (Table 1) and the perceived most important source of information utilized in making decisions about reproductive management (Table 2) with the impact of information sources on the use of recommended reproductive management practices (Table 3). These findings suggest that the clientele' perceptions regarding the importance of information sources for a subject matter is not always congruent with the influence of those information sources on the use of recommended practices in that particular subject matter.

In this study, dairy farmers' knowledge of reproductive management was hypothesized to influence the use of reproductive management practices. A constructed knowledge index was used as a variable to measure the dairy farmers' knowledge of reproductive management. The knowledge index variable is a summated score derived from responses to the use of six selected reproductive management practices. The final results of the multiple regression analyses indicated that the dairy farmers' knowledge index of reproductive management had a highly significant relationship ($p < .001$) with the use of recommended practices in the five areas of reproductive management.

Results of a chi-square analysis comparing respondents who had average or high knowledge index with those who had below average knowledge index on the frequency of receiving information from selected sources of information are presented in Table 5. The frequency of receiving information from veterinarians (phi = .17), A.I. organizations (phi = .16), other farmers (phi = .14), and farm or dairy magazines (phi = .18) had a significant, although low, relationships with the dairy farmers' knowledge index. Those dairy farmers with an average to high knowledge index as contrasted with dairy farmers with a below average knowledge index reported a greater proportion occasionally or frequently used of veterinarians, A.I. organization, other farmers, and farm or dairy magazines as sources of reproductive management information. Data in Tables 1 and 2 indicate that veterinarians were perceived as the most important source of

Table 5. Chi-square Results Comparing the Dairy Farmers' Knowledge Index on the Frequency of Receiving Information from Selected Sources.

Variable	Knowledge Index		Chi-square	ϕ (Phi)
	Below Average[a]	Average to High[b]		
	- % -	- % -		
Frequency of information from cooperative extension			1.8097	.0895
Never	16.4	10.1		
Occasionally or frequently	83.6	89.9		
Frequency of information from veterinarians			6.1603	.1658*
Never	20.9	8.9		
Occasionally or frequently	79.1	91.1		
Frequency of information from A.I. organization			6.0107	.1638*
Never	61.2	43.3		
Occasionally or frequently	38.8	56.7		
Frequency of information from farm or dairy magazines			7.0174	.1770**
Never	46.3	28.0		
Occasionally or frequently	53.7	72.0		
Frequency of information from other farmers			4.5829	.1447*
Never	16.7	7.2		
Occasionally or frequently	83.3	92.8		

[a] Below average: score of knowledge index=4 or less

[b] Average to high: score of knowledge index=5 or 6

* significant at .05 level

** significant at .01 level

information for reproductive management followed by farm or dairy magazines, and A.I. organization personnel and publications.

Results of the final multiple regression analyses indicated that no significant relationships existed among those three aforementioned sources of information with the use of recommended reproductive management practices. However, dairy farmers' knowledge index of reproductive management had a highly significant relationship ($p < .001$) with the use of recommended practices in the five areas of reproductive management. Furthermore, data in Table 5 indicate that dairy farmers who had an average or high knowledge index, contrasted with those who had a below average knowledge index reported a greater proportion occasionally or frequently used veterinarians, A.I. organizations, and farm or dairy magazines as sources of reproductive management information. This findings suggest that those three aforementioned sources of information influenced the use of reproductive management practices through their impact on the dairy farmers' knowledge in that area.

Recommendations

Based on results of the study, the following recommendations are offered to extension educators:

1. Besides providing educational programs directly to the clientele, the use of sources of information that are perceived to be important as channels to reach the target audience may enhance the effectiveness of the educational programs. In the area of dairy reproductive management, those information sources are veterinarians, farm or dairy magazines, A.I. organizations, farm newspapers, feed company personnel, and key local farmers.

2. The use of information sources that influence the use of recommended practices as channels to deliver information to the clientele may increase the effectiveness of educational programs. Dairy Herd Improvement Association (DHIA), feed company personnel, and farm management consultants may serve as effective channels in influencing the use of recommended practices in feeding. DHIA is also an effective source of information in influencing the use of recommended practices in dairy reproductive herd health.

3. Veterinarians, farm or dairy magazines, A.I. organization personnel, and local key farmers are sources of information that related significantly to the dairy farmers' knowledge index of reproductive management. As the dairy farmers' knowledge index is highly related to the use of recommended practices in the five areas of reproductive management, those four aforementioned sources of information may serve as effective channels in increasing the use reproductive management practices.

References

Bruening, T. H. (1991). Communicating with farmers about environmental issues. ACE Quarterly, 75(1).

Dillman, D. A. (1986). Cooperative extension at the beginning of 21st century. The Rural Sociologist, 6(102).

Gilmore, G. D., Meehan-Strub, M. & Mormann, D. (1992). Community-based food safety survey. Journal of Extension, Spring, 37.

Kramic, J. L. (1987). The level of impact of agricultural information sources on production and marketing decisions of Ohio farmers. Unpublished master of science thesis. Columbus: The Ohio State University.

Krejcie, R. V. & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30(607).

Miller, L. E. & Smith, K. (1983). Handling nonresponse issues. Journal of Extension, 24(11).

Peisher, A. V. & Harrison, J. A. (1992). Nutrition Information Needs and Sources. Journal of Extension, Spring, 36.

Smith, R. D. (1982). The team approach for solving reproductive problems in dairy herds. Proceedings of National Invitational Dairy Cattle Reproduction Workshop. Louisville, KY.

Sterner, K. E. (1986). Reproductive herd health--A veterinarian's perspective. Proceedings of Dairy Reproduction Management Seminar "Optimizing Reproductive Performance in Progressive Herds. Penn State Cooperative Extension Service.

AN ANALYSIS OF INFORMATION SOURCES USED IN DAIRY REPRODUCTIVE MANAGEMENT

A Critique

Randol G. Waters, The University of Tennessee--Discussant

Extension educators have constantly sought to identify "preferred channels/sources of information" for their educational clientele operating under the assumption that if clients receive educational information through their "preferred channels," they are more likely to adopt practices which bring about positive change. With minor exception, I am unfamiliar with other recent Extension-related research intended to test this assumption. The authors are commended for their efforts to do so.

Generally, the authors are to be commended for the systematic way they conducted their study and the measures taken to increase reliability and validity of measurement and to increase the validity of the study. Although a 95% confidence level was a worthy goal, as happens in most survey studies, the usable response rate of 61.2% lowers the confidence in findings such that it may be appropriate to take another one of Miller's and Smith's recommendations and actually identify a small sample of non-responders to compare with responders on key variables.

Conclusions regarding the first objective of the study appear to be sound, although perhaps somewhat disappointing to Extension agents. However, it is not surprising that dairy farmers perceive veterinarians as the most important source of information when making important decisions about reproductive management. One must note in Table 2 that the top four perceived "most important sources" are specifically tied to dairy reproductive management. Extension agents, being generalists regarding their agricultural knowledge, would not be expected to be perceived more important than "specialists" in the dairy industry. It would have been interesting to learn where "Extension dairy specialists" would have ranked in the list of sources, had it been given as an option for consideration.

The relationship between "sources of educational information" and "adoption of practices" remains unanswered in the study. A number of questions arise from the researchers use of the multiple regression analysis. Table 3 lacks the specific information to help the reader determine much about the relationships. What was the total percent of explained variance in each of the dependent variables which could be attributed to variance in the independent variables remaining in each regression equation (R2)? What were the actual slope coefficients for variables in the equation? What were the partial or part correlation coefficients? Was consideration given to the possibility of interactive effects of any of the independent variables (i.e., Is it possible that the impact of a single source of information may be dependent upon another source)? It would have also been extremely useful to describe the relationships rather than to simply say they existed. Were they all "positive", or were there some sources which were "negatively" related to the dependent variables? The authors were correct in steering clear of any hard conclusions regarding this objective.

In summary, the study is an admirable attempt to learn more about preferred sources of information and I encourage the researchers to continue their efforts. Replication of findings in future studies using additional methods of analysis will enhance the plausibility of their findings.

TRAINING NEEDS OF AREA SPECIALIZED EXTENSION AGENTS IN THE NORTH CAROLINA COOPERATIVE EXTENSION SERVICE

Jerry D. Gibson
Extension Agent
North Carolina Cooperative Extension
North Carolina State University

John Hillison
Professor
Agricultural Education
Virginia Tech

Introduction and Theoretical Framework

The Cooperative Extension Service (CES) is a nonformal educational organization whose purpose is to transfer practical, research-based knowledge from land-grant colleges to citizens who can use that knowledge to improve their quality of life. Land-grant institutions have their roots in the passage of the Morrill Land Grant Act of 1862, which was created to promote the teaching of agricultural and mechanical arts (Bliss et al., 1952; Brunner, 1962; Parker, 1924). Helping people bring about change and adapt to change are major strengths of the organization. The Extension Service itself is undergoing change as it addresses complex social issues and attempts to reach new audiences. To meet these challenges, the Extension Service has supplemented its staff of nonspecialized county agents with specialized area agents who have more in-depth knowledge of specific subject areas.

The Emergence of Area Specialized Extension Agents

Since the passage of the Smith-Lever Act of 1914, extension agents have been nonspecialists--that is, they have had to be knowledgeable about all aspects of agriculture. Today agriculture, along with all other areas of society, is developing so quickly and becoming so specialized that extension agents with responsibility for broad subject areas cannot keep up with the technology. As early as 1966, York noted that the increasing complexity of farm technology and other problems associated with commercial agriculture demanded better-trained, more highly specialized agents. Boone (1990) noted that the trend toward hiring professionals with highly specialized advanced degrees to fill extension positions at both the state and county levels is accelerating. To address the problem, the North Carolina Cooperative Extension Service (NCCES) has added area specialized extension agents (ASEAs) to its field staff. These agents cover a territory consisting of several counties and specialize in a single subject area. Currently, North Carolina has 66 ASEAs working in 18 different subject areas. Although the number of specialized positions is growing in all subject areas, the majority of these positions are in farm management.

Purposes and Objectives

This study was designed to determine which of the competency areas the ASEAs, administrators, and subject-matter specialists of the North Carolina Cooperative Extension Service consider most important and in which of these areas they perceive a need for training programs. A secondary purpose was to determine the level of agreement between the opinions of the ASEAs and those of subject-matter specialists and administrators (i.e., district directors and county directors where the ASEAs work) about the importance of the various competency areas to the effectiveness of the agents. The study also determined the topics within the competency areas that ASEAs would like to have included in programs of in-service training. In addition, data on selected demographic characteristics were collected in this study. Those data were analyzed and used for descriptive purposes.

The specific objectives of the study were to:

1. Determine the importance of and the need for training in each of the eight competency areas as expressed by ASEAs, subject-matter specialists, and administrators.

2. Determine the differences in importance of and need for training in each of the eight competency areas as expressed by ASEAs, subject-matter specialists, and administrators.

3. Determine the importance of and the need for training for the specific items in each of the eight competency areas as expressed by ASEAs, subject-matter specialists, and administrators.

4. Determine the differences in importance of and the need for training for the specific items in the eight competency areas as expressed by ASEAs, administrators, and subject-matter specialists.

5. Describe selected demographic characteristics of the ASEAs of the NCCES including age, race, gender, level of education, and years of experience with the Extension Service.

6. Develop a training model for ASEAs employed by the NCCES.

Methods and Procedures

Population

The population for this study consisted of 66 ASEAs, 49 administrators, and 18 subject-matter specialists employed by the North Carolina Cooperative Extension Service.

Data Collection

During the Fall of 1991 when data were collected 94% or 125 of the 133 potential respondents returned the questionnaire in usable form. By respondent group, the percentages returned were: 91% (n = 60) for ASEAs; 96% (n = 47) for administrators; and 100% (n = 18) for subject-matter specialists.

McCormick (1959) was the foundation for the questionnaire used in this study. Price (1960) adapted it for use in Arkansas. Hubbard (1971) further adapted the questionnaire and utilized it to study the training needs of extension agents of the Clemson Extension Service in South Carolina. Permission was granted to modify the instrument and use it in the present study of ASEAs employed by the North Carolina Cooperative Extension Service.

The questionnaire focused on eight competency areas identified by the Extension Committee on Policy as necessary for the effectiveness of extension agents (National Policy Statement, 1968). Three forms of the same questionnaire were used in the study, one for each group of respondents.

Responses to items in the questionnaire fell into two categories. The first was ratings of the importance of each competency area and specific items in those areas to the effectiveness of ASEAs. Administrators, ASEAs, and subject-matter specialists indicated their opinions of the degree of importance by selecting one of the following ratings: "little or none," "moderately important," "important," or "very important."

The second category of responses dealt with opinions about the need for training of ASEAs in each competency area and specific items in those areas. ASEAs, administrators, and subject-matter specialists indicated the degree to which they believed ASEAs need training in each item by selecting one of the following ratings: "little or none," "moderate need," "need," or "great need."

Reliability of the questionnaire was estimated by field testing the instrument with 16 ASEAs employed by the Virginia Cooperative Extension Service and assessing the results by the split-half method. Reliability for the section pertaining to importance of competencies was .93; reliability of the section pertaining to the need for training was .96. The instrument used in this study has been validated by documentation of previous studies, and assessment of content validity by experts.

Data Analysis

The data were analyzed at the Computer Center of North Carolina State University using the Statistical Package for the Social Sciences (SPSS-X). The computer package provided the necessary analytical procedures for calculating descriptive statistics such as means and frequencies.

Results and/or Findings

Six research objectives were developed for this study. The results of the analysis of data for each of the six objectives are presented in the following discussion.

Objective 1

The importance of training and the need for training in each of the eight competency areas were rated by ASEAs, subject-matter specialists, and administrators. Competency areas rated 3.0 or greater were deemed important. Program planning, communication, human development, and educational processes were rated 3.0 or greater by ASEAs. Administrators rated extension organization, program planning, communication, research, human development, educational processes, social systems, and effective thinking 3.0 or greater. Specialists rated program planning, communication, research, human development, and educational processes 3.0 or greater. ASEAs, administrators, and subject-matter specialists all ranked program planning first out of the eight areas of competency. Tables 1 displays the data.

Table 1
Need for Training: Eight Areas of Competency

	ASEAs		Admins.		Specialists	
Competency areas	M	Rank	M	Rank	M	Rank
1. Program planning	2.5	1.0	3.3	1.0	2.9	1.0
2. Educational processes	2.4	2.0	3.0	2.0	2.7	3.5
3. Communication	2.3	3.5	2.9	3.5	2.6	6.0
4. Research	2.3	3.5	2.9	3.5	2.8	2.0
5. Human development	2.2	5.5	2.7	7.0	2.6	6.0
6. Effective thinking	2.2	5.5	2.7	7.0	2.7	3.5
7. Extension organization	2.1	7.5	2.8	5.0	2.5	8.0
8. Social systems	2.1	7.5	2.7	7.0	2.6	6.0
Grand M	2.3		2.9		2.7	

Note. ASEAs = Area specialized extension agents.
Admins. = District directors and county directors.
Specialists = Subject-matter specialists.
Scale: 1.0 = little or none, 2.0 = moderate need, 3.0 = need, and 4.0 = great need.

Objective 2

Ratings of the importance of and need for training in each of the eight competency areas as expressed by ASEAs, subject-matter specialists, and administrators were compared for differences. For the purposes of this study, a difference of 1.0 or greater was considered an important difference. No important differences were measured. The greatest difference (0.4) was in the extension organization competency area. Likewise, no important differences were measured in ratings of need for training. The greatest difference (0.8) was in the competency area of program planning.

Objective 3

The importance of and the need for training in specific items within each of the eight areas of competency were rated by ASEAs, subject-matter specialists, and administrators.

Within the extension organization and administration competency area, ASEAs rated philosophy, University/USDA-partner, professional improvement, county responsibilities, area responsibilities, specialists' responsibilities, and promotion procedures 3.0 or greater in importance. Administrators rated history, philosophy, University/USDA-partner, professional improvement, policies, county responsibilities, area responsibilities, district responsibilities, specialists' responsibilities, office management, promotion procedures, and retirement procedures 3.0 or greater in importance. Specialists rated philosophy, professional improvement, county responsibilities, specialists' responsibilities, and promotion procedures 3.0 or greater in importance. ASEAs rated area responsibilities highest. Administrators rated area responsibilities and county responsibilities in a tie for first, whereas specialists rated philosophy and county responsibilities highest.

In terms of need for training in items within the extension organization and administration competency area, ASEAs rated area responsibilities and promotion procedures highest. Administrators rated county responsibilities and area responsibilities highest, and specialists rated professional improvement highest.

In the program planning competency area, ASEAs rated developing programs highest in importance. Administrators rated identifying problems and developing programs highest, whereas specialists rated role of area agents and involving lay people highest in importance. In terms of the need for training in this competency area, ASEAs rated developing programs and evaluation highest. Administrators rated developing programs highest, whereas specialists rated identifying problems highest.

In the communication competency area, ASEAs rated understanding communication and effective newsletters highest in importance. Administrators rated effective visits highest; while specialists rated understanding communication and using computers highest in importance. In terms of need for training in this competency area, ASEAs rated using visual aids and using computers highest. Administrators rated using visual aids, effective newsletters, and using computers highest. Specialists rated using computers highest.

In the research competency area, ASEAs rated evaluating programs and applying research highest in importance. Both administrators and specialists rated applying research and utilizing research highest in importance. In terms of need for training in this competency area, ASEAs rated evaluating programs highest. Administrators rated applying research highest, whereas specialists rated utilizing research highest.

In the human development competency area, ASEAs rated problems of different groups and developing leadership highest in importance. Administrators rated factors with behavior highest; while specialists rated developing leadership highest in importance. In terms of need for training in this competency area, ASEAs rated developing leadership highest. Administrators rated developing leadership and feelings and people highest. Specialists rated developing leadership highest.

In the educational process competency area ASEAs, administrators, and specialists all rated effective teaching highest in importance. ASEAs, administrators, and specialists also all rated effective teaching highest in the need for training.

In the social system competency area, ASEAs rated roles of informal leaders and interaction among agencies highest in importance. Administrators rated identifying leaders and interaction among agencies highest, whereas specialists rated interaction among agencies highest in importance. In terms of need for training in this competency area, ASEAs, administrators, and specialists all rated interaction among agencies highest.

In the effective thinking competency area, ASEAs rated problem solving highest in importance. Administrators rated techniques for effective thinking highest; while specialists rated logical reasoning, problem solving, and techniques for effective thinking highest in importance. In terms of need for training in this competency area, ASEAs, administrators, and specialists all rated techniques for effective thinking highest.

Objective 4

Differences in ratings of the importance and the need for training among the three respondent groups were determined for the specific items within the eight competency areas. A difference of 1.0 or greater among groups was considered an important difference. The results are reported here by competency area.

There were no important differences in the ratings of the importance for items in the extension organization and administration competency area. There were, however, important differences among groups in ratings of the need for training in history (1.0), philosophy (1.1), University/USDA-partner (1.0), and county responsibilities (1.2).

There were no important differences in the ratings of the importance for the program planning competency area. There was an important difference among groups in ratings of the need for training in program planning (1.0).

There were no important differences in ratings of the importance or the need for training in communication, research, human development, educational process, social systems, and effective thinking.

Objective 5

Selected demographic characteristics of the ASEAs of the NCCES included age, race, gender, level of education, and years of experience with the extension service. The educational level of ASEAs ranged from bachelor's degrees to doctorates. The majority of agents hold master's degrees; only 5% hold doctorates.

The length of time that ASEAs had held their present positions ranged from 1 to 23 years. The average age of ASEAs employed by the NCCES was 38 years old. Over 50% of the respondents had served in their current position for 5 years of less. Thirty-three percent had served for 3 years or less.

The length of time that the ASEAs had worked in extension ranged from 1 year to 33 years. Over 50% had served for 6 years or less. Seventeen percent had served for 3 years or less. Five percent had served for 33 years.

The majority of ASEAs employed by the NCCES were males. Eighty-two percent (n = 49) of ASEAs were male, 18 % (n = 11) were females. The majority of ASEAs (95%) were Caucasian (n = 57); only 5% (n = 3) were members of minority groups.

Objective 6

A training model for ASEAs employed by the North Carolina Cooperative Extension Service was developed by examining the training need ratings of the eight competency areas and specific items within each competency area. The criterion used to determine whether a particular content item would be included in the model was receiving a mean score of at least 2.5 from all three groups on training needs. Of the eight competency areas, only program planning met the criterion. Within the program planning competency area, the specific items that received ratings of at least 2.5 from all three groups were role of area agents, involving lay people, long-term program development, area agent programming, developing programs, and evaluation (Table 2).

Table 2
Competency Need: Program Planning

Competency areas	ASEAs M	ASEAs Rank	Admins. M	Admins. Rank	Specialists M	Specialists Rank
Developing programs	2.7	1.5	3.5	1.0	3.0	2.5
Evaluation	2.7	1.5	3.3	5.5	2.9	6.5
Involving lay people	2.6	3.5	3.3	5.5	2.9	6.5
Area agent programming	2.6	3.5	3.3	5.5	2.9	6.5
Role of area agents	2.5	5.5	3.4	2.0	3.0	2.5
Long-term program development	2.5	5.5	3.3	5.5	2.9	6.5
County program analysis	2.4	8.0	3.3	5.5	2.9	6.5
Program committees	2.4	8.0	3.1	10.5	2.8	10.0
Identifying problems	2.4	8.0	3.2	9.0	3.1	1.0
Program planning	2.3	11.0	3.3	5.5	2.9	6.5
Plan of work	2.3	11.0	3.1	10.5	2.4	12.0
Utilizing specialists	2.3	11.0	2.9	12.0	2.6	11.0
Grand M	2.5		3.3		2.9	

Note. ASEAs = Area specialized extension agents.
Admins. = District directors and county directors.
Specialists = Subject-matter specialists.
Scale: 1.0 = little or none, 2.0 = moderate need, 3.0 = need, and 4.0 = great need.

Conclusions and/or Recommendations

The conclusions reached, based upon the findings of the study, are as follows:

1. Program planning is the only competency area identified from the eight competency areas to be included in training for ASEAs.

2. ASEAs, administrators, and subject-matter specialists agree on the training needs of ASEAs in the eight general competency areas.

3. ASEAs, administrators, and subject-matter specialists agree on the importance of the eight general competency areas.

4. Training should be provided in the following program planning competency area items: role of area agents, involving lay people, long-term program development, area agent programming, developing programs, and evaluation.

5. The three respondent groups' disagree on the need for training for the item history, philosophy, University/USDA-partner, and county responsibilities in the extension organization and administration competency area and for the item program planning in the program planning competency area. The groups agree on the importance of training in the items in the eight competency areas.

6. The typical ASEA employed by NCCES is a 38 year old white male holding a Master's degree with a tenure of slightly more than 5 years.

Recommendations

Based upon the findings of this study and conclusions drawn, the following recommendations are offered:

1. The findings of this study should be made available to the administrative council of the North Carolina Cooperative Extension Service.

2. The staff development personnel should implement the proposed area specialized extension agent development institute.

3. The findings of this study should be made available to ASEAs, county directors, and district directors employed by the NCCES.

4. Research should be conducted in other states with ASEAs utilizing the instrument revised for this study to determine their training needs and the level of agreement between administrators, subject-matter specialists, and ASEAs.

References

Bliss, R. K., Symons, T. B., Wilson, M. L., Gallup, G., Reese, M. J., & Schruben, L. M. (1952). The spirit and philosophy of extension work. Washington, DC: United States Department of Agriculture and Epsilon Sigma Phi, National Honorary Extension Fraternity.

Boone, E. J. (1990). Crossing lines. Journal of Extension, 28, 3-5.

Brunner, H. S. (1962). Land-grant colleges and universities, 1862-1962. Washington, DC: United States Department of Health, Education, and Welfare.

Hubbard, R. C. (1971). Training needs of county extension agents in South Carolina. Unpublished doctoral dissertation, Raleigh: North Carolina State University.

McCormick, R. W. (1959). An analysis of training needs of county extension agents in Ohio. Unpublished doctoral dissertation, Madison: University of Wisconsin.

National policy statement on staff training and development. (1968). Staff Training and Development Subcommittee, National Extension Committee on Policy. Madison: University of Wisconsin, University Extension.

Parker, W. B. (1924). The life and public services of Justin Smith Morrill. Boston: Houghton Mifflin.

Price, R. K. (1960). An analysis of education needs of Arkansas extension agents. Unpublished doctoral dissertation, Madison: University of Wisconsin.

York, E. T. (1966). A look to the future. In H. C. Sanders (Ed.), The Cooperative Extension Service (pp. 67-89). Englewood Cliffs, NJ: Prentice-Hall.

TRAINING NEEDS OF AREA SPECIALIZED EXTENSION AGENTS IN THE NORTH CAROLINA COOPERATIVE EXTENSION SERVICE

A Critique

Randol G. Waters, The University of Tennessee--Discussant

This study addresses the very important issue of staff development needs for area specialized Extension agents in North Carolina as perceived by the agents themselves, their administrators and a select group of state Extension specialists. I commend the authors for addressing this topic in an attempt to develop a training model for the agents.

The objectives of the study were clearly written and appropriate considering the stated purpose. However, the theoretical framework is somewhat limited. Although the authors adequately covered the historical literature associated with the development of the Agricultural Extension Service, the review of staff development literature is limited to studies which took place over 20 years ago and the instrument used in the study is a "modified" version of one used by McCormick more than 30 years ago. Although it is possible that the instrument is still appropriate for use today, there are numerous recent studies which could assist the researchers in their attempt to develop a valid instrument.

The researchers established high internal consistency scores which indicate the scales are quite homogenous. However, I wonder about the logic of studying internal consistency of a set of questions asking respondents about "their need for training in specific areas". Why would one assume that the need for training in one area would be similar to the need for training in another area? A "low" internal consistency score would simply mean that their needs for training were not the same in each area... and that fact would not have any implications regarding the reliability of the instrument itself. I question whether evidence of internal consistency really says anything about the reliability of this instrument. It would be much more appropriate to calculate a coefficient of stability based upon test-retest data.

Findings from the study are interesting, particularly as they relate to the "perceived need for training." I agree with the researchers in their conclusion that agents do not really perceive a need for training in any of the areas identified on the instrument, with the exception of program planning. I wonder whether this is a true reflection of need for training, or simply a reflection of low face and content validity of the instrument. Did respondents really consider their needs for inservice as they rated the categories, or did they simply acquiesce to the "middle of the scale" without much consideration of their true need? The high internal consistency score leads me to believe that the latter may be true.

One of the more recent improvements in needs assessment methodology which would help guard against this possibility is to develop the instrument in a two-step process somewhat similar to a Delphi study. The Borich Needs Assessment Model which was popular in our literature a few years ago is a good example of this process. In Borich's model, the first questionnaire sent to respondents is "open-ended" and simply asks them to list topics in areas where they perceived a need for inservice. The second questionnaire is developed from responses to the first one. Respondents are then asked to rate the importance of a list of topics... but these topics are ones which the respondents have "internalized." The instrument has more validity for them because they have helped develop it.

DEVELOPMENT OF AN ACTION RESEARCH PROCESS TO EVALUATE AND IMPLEMENT A NEW VISION IN THE CORNELL COOPERATIVE EXTENSION 4-H YOUTH DEVELOPMENT PROGRAM

Mhora Newsom-Stewart
Post-Doctoral Researcher
Department of Education
Cornell University

Introduction

This research seeks to develop a process to assist organizations to adapt to their changing environment. The organization under investigation is the Cornell Cooperative Extension, 4-H Youth Development Program, an educational human service organization focusing on youth. Due to existing fiscal situations and resulting budget cuts, rapidly changing clientele and a changing focus, Cooperative Extension, like other organizations, is encountering enormous pressures to change (Forest, 1990; Merriam & Caffarella, 1991). In order to assist the organization to better survive this era of change it is necessary that techniques be developed to allow it to construct meaning, take charge of the environment, develop necessary skills and more successfully integrate program planning, evaluation and implementation.

Program planners have developed a number of methodologies by which they can evaluate a program. One of the methodologies frequently used by Cooperative Extension is evaluability assessment (Smith, 1989). This technique attempts to define the meaning of a program as intended by program developers and as interpreted by stakeholders. During the implementation of a new program it could be expected that perceptions of the meaning of the program might differ. These differing perceptions must be identified and shared. Educational theories and tools have been used for identifying and sharing the meaning of events and might be useful in evaluation and implementation of a new program.

The evaluative technique of action research has been determined by Bryant and Usher (cited in Deshler & Hagan; 1990) to minimize the well-documented gap between research and practice (Ewert, 1990) and has been frequently used in organizations (Gordon, 1991). It is an evaluative technique which requires the researcher to act as an active agent for change as well as an observer. The application of educational theories and tools in an action research process could be used to integrate program planning, evaluation and implementation through the simultaneous examination of existing perspectives of a program and the development of a more shared meaning for the program within an organization.

Similarly, the development of a more shared meaning for a new vision is crucial to the success of an organization. A variety of authors have stressed the importance of vision in organizational success (Blanchard et al., 1985; Gordon, 1991). Vision has been described as a way of fostering a feeling of community and therefore satisfying some of the higher level needs of Maslow's hierarchy (Vaill, 1989). Block (1987, p. 99) carries this one step further and states that "Meaning comes from the act of creation and the primary thing we create at work is a successful and useful organization." According to this view the vision of an organization expresses the personal values of its members. Its members gain personal satisfaction and fulfillment in achieving the vision. A vision serves as a means by which members of the organization can achieve autonomy by making decisions to act on the vision and by building their own vision.

Therefore, one of the first steps in the empowerment of an organization is vision development (Blanchard et al., 1985; Block, 1987; Gordon, 1991). The action of enactment of the vision is, according to Block (1987; p. 189) "The Essence of Empowerment." The first step toward enactment of the vision is to communicate it to the rest of the organization. This requires that the vision be shared.

The existence of a clear and shared vision has been determined to be critical to a successful organization (Block, 1987; Vaill, 1989). An evaluative technique which facilitates the sharing of the meaning of the vision would be likely to increase success and adaptation of the organization. During the implementation of a new organizational vision, the assessment of existing perceptions of the vision is critical to implementation and program planning aimed at the development of a shared vision.

Since reflection has been determined to be a key component of learning in adults (Belenky et al, 1986; Friere, 1970; Mezirow, 1990; Novak, 1977a) it is necessary that individuals in an organization reflect on the meaning of the vision during any vision implementation and evaluation process. This reflection should encourage the identification of perceptions crucial to the sharing of vision meaning and to the development of a shared vision.

In order to develop a shared vision it is necessary that individuals be able to share their perspectives on the vision and use these individual perspectives to construct a 'shared perspective'. Tools or theories which enable the clarification of these perspectives are necessary. Assimilation theory is an educational theory based on a constructivist paradigm of epistemology (Ausubel, 1968, Novak, 1977a). Assimilation theory posits that meaningful learning results when new concepts or ideas are interpreted and connected with an individual's prior knowledge structure. According to this view, knowledge consists of concepts and propositions and is 'constructed' by individuals based on what they already know. The perception of an event (or program) is based on existing knowledge. Knowledge depends on experience. Different perceptions of a program will lead to different understandings of program meaning.

In order to implement a new vision it is necessary that existing perceptions of vision meaning be identified and shared. Additionally, the new material must be meaningful (concepts defined and specified) to allow the learner to actively relate the new material to an existing knowledge structure. This requires that program planners identify the concepts and propositional structure of new material.

Based on the preceding literature review, a successful 'learning of the vision' in an organization requires an emphasis on process, a goal of empowerment, stakeholder interaction and involvement in the learning process, reflection on and critique of the meaning of the vision and concepts related to the vision and the identification and sharing of these meanings. This will allow the vision to be learned meaningfully and encourage the development of commitment to the new vision.

The Cornell Cooperative Extension 4-H Youth Development Program has recently developed a new vision. For the vision, to "be a leader in the design and delivery of experiential youth education programs and resources" (Vision Statement card, 1993), to be successful it must be shared. It is critical for program planners to determine if the meaning of this vision is shared throughout the organization. If individuals within the organization do not share the meaning it is necessary that program planners learn techniques to enable them to implement the vision in the organization by communicating the meaning of the vision.

Purpose and Research Questions

This research is designed to develop and evaluate a process to allow program planners in human service organizations to evaluate existing perceptions of a new vision as it is being implemented. Educational learning theory is utilized as a tool for evaluation and organizational empowerment by facilitating the sharing of program meanings and encouraging meaningful learning. An action-oriented approach takes into account the budgetary and time constraints of both the organization and researcher.

This case study was designed to answer the questions: 1. What perceptions of the organizational vision exist in the Cornell Cooperative Extension System? and 2. Do different groups of individuals in the Cornell Cooperative Extension System have different perceptions of the vision?

Procedures

Methodology for this research was developed to share meaning, encourage reflection on the meaning of the vision and related concepts and encourage empowerment of the organization and its members.

The research was designed as a qualitative study with a quantitative base. The study used mixed methods as a means of triangulating and clarifying results and to extend the breadth and depth of findings (Greene et al., 1989). According to Greene, mixed methods are also appropriate when it is desired to use the results of one method to develop another or to discover new frameworks or perspectives on one method using the results of the other. During this study, mixed methods helped achieve these goals.

The study was conducted in three phases, an initial pilot study which resulted in a change in the interview instrument followed by a second pilot study. A full-scale study was then initiated which consisted of two phases, a quantitative mailed survey questionnaire and a qualitative component. All phases of the study were designed to encourage reflection on the vision and the meaning of vision related concepts. These concepts included learning, experiential education, knowledge, empowerment and youth development. In an attempt to encourage reflection on the meaning of the vision, respondents were also asked what characteristics of the environment they felt most needed to be successfully coped with by the organization if it were to be successful. According to learning theory, reflection should encourage learning and increase the success of the vision.

Qualitative interview techniques were used during the pilot studies and Phase III to allow the emergence of various perspectives on the vision and encourage the development of a shared vision. Since the purpose of naturalistic inquiry is to understand an event, not to test a hypothesis (Guba & Lincoln, 1989) this inquiry was naturalistic, non-manipulative and non-controlling. Interviews were conducted following the recommendations of Patton (1990) and Guba and Lincoln (1989). Twenty eight respondents participated. Multiple perspectives on the issues were obtained from different levels of the organization including volunteers, faculty and association and state level administrators.

Quantitative techniques were used during Phase II to increase the amount of data which could be collected and the generalizability of the findings. The mailed pencil and paper questionnaire was designed following recommendations of Dillman (1978). The final sample consisted of 24 Cornell Departmental Faculty, five members of each of the 58 associations in New York State and three state level administrators. A total of 317 surveys were mailed and 188 received in time to be analyzed yielding a response rate of 59.3%. Survey reliability and validity was assessed following the recommendations of Dillman (1978) and Fowler (1988). The instrument was determined to be valid and reliable.

Analysis of Data

Results of qualitative interviews were analyzed using a concept mapping process developed by Joseph Novak (1977a) based on principles of assimilation theory. As described in previous work (Newsom-Stewart & Roellke, 1993), concept maps are an analytic tool used to represent a hierarchical conceptual knowledge framework (Novak, 1977a). Concepts are linked by lines with appropriate linking words to create valid statements. The resulting map can depict the knowledge structure of individuals which they use to perceive and make meaning of experiences. In order to facilitate the reader's understanding of concept maps as well as the research design, an example map was constructed. This map is shown in Figure 1.

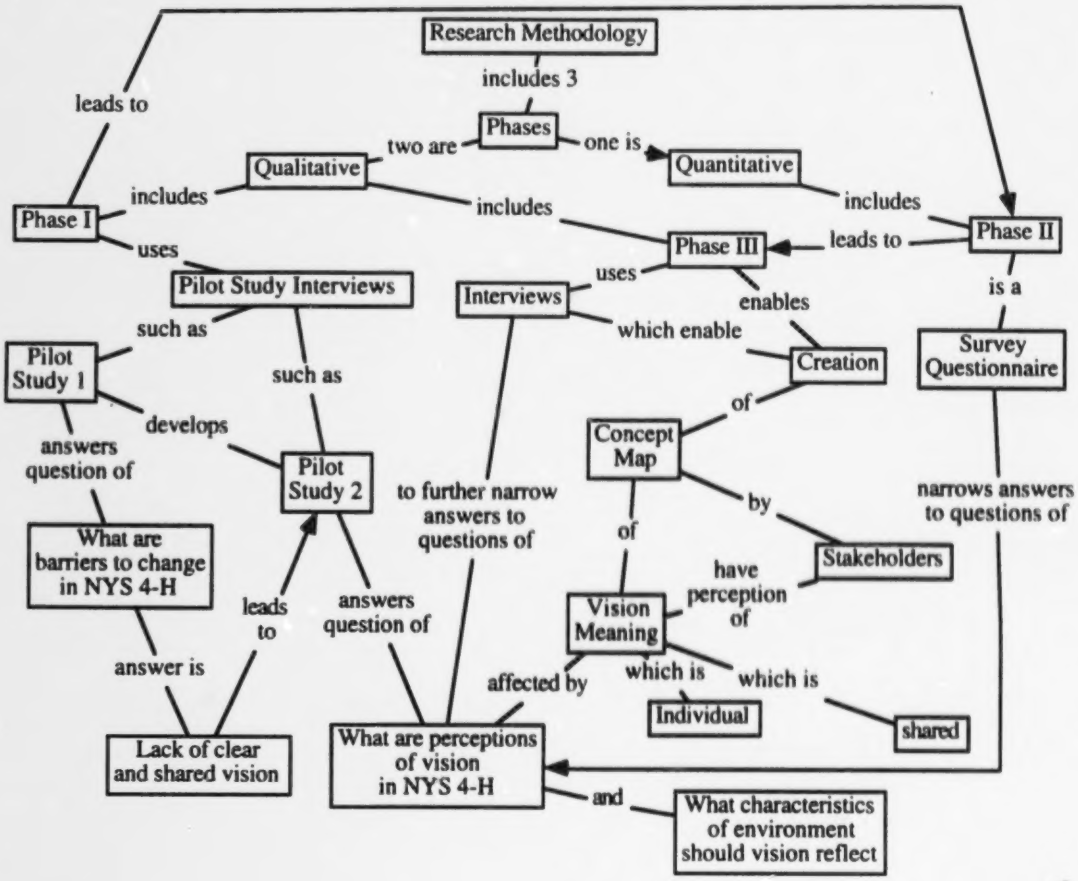

Research Methodology
includes 3
Phases
two are
one is
Qualitative
Quantitative
leads to
includes
includes
includes
Phase I
Phase II
Phase III
leads to
uses
uses
Pilot Study Interviews
Interviews
enables
is a
such as
which enable
Pilot Study 1
such as
Creation
Survey Questionnaire
develops
of
answers question of
Concept Map
Pilot Study 2
to further narrow answers to questions of
by
narrows answers to questions of
What are barriers to change in NYS 4-H
of
Stakeholders
leads to
answers question of
have perception of
Vision Meaning
answer is
affected by
which is
which is
Individual
shared
Lack of clear and shared vision
What are perceptions of vision in NYS 4-H
and
What characteristics of environment should vision reflect

Figure 1
Concept Map-Research Design

Figure 1 acts as a visual representation of the research design. The map clearly indicates the relationship between Phases I, II and III of the study as well as the purpose and relationship between the two pilot studies. Concept maps are generally useful to act as a clear and succinct visual representation and summary of a concept or idea. They can also be used to summarize the primary concepts developed from qualitative interviews.

Quantitative questionnaire results were analyzed statistically using SPSS on the PC. Frequencies were obtained on all data. Means and standard deviations were used to summarize the scale results. It should be remembered that, in order to examine means and standard deviations of a scale, it must be assumed that intervals between numbers are equally spaced. In order to allow the summary of data this assumption was made during the analysis process.

Statistical comparisons between groups were made on categorical data using cross tabulations and Pearson's chi-square. Analyses were made by gender, position in the organization and experience. Comparisons of scale means by gender, experience and position were calculated using analysis of variance or t-tests. In cases in which significant differences were found, Duncan's least significant difference was calculated to identify the groups which differed.

Results

Results indicate a new vision in the early stages of implementation. Results are summarized here. More detailed information is published elsewhere (Newsom-Stewart, 1993).

* A number of different perspectives and beliefs were identified. These differing perspectives were in part due to varied understandings of vision-related concepts such as learning, knowledge, experiential education, youth development and empowerment. Respondent understanding of these concepts differed by gender, position and length of time in the organization. Additionally, volunteers rated themselves as having a less clear understanding of the vision-related concepts than either agents or administrators (p=.04).

* Shared themes and perceptions of the vision were identified. Agreement or disagreement about the meaning of the vision appears to focus around a number of themes. Areas of contention include the degree of top-down versus bottom-up involvement in education, the need for ownership over the educational process, the use of teamwork and the inherent nature of individuals (whether basically lazy or self-motivated). Areas of agreement include the need for change in behavior or attitudes; the role of process in education and the need for empower-ment, development of life skills, reflection and application of learned techniques to real life.

* A shared vision was developed which all participants felt they could agree with. However, most respondents felt that they preferred their own vision. The map of the shared vision is shown in Figure 2.

* Respondents felt that environmental characteristics of time pressure and lack of resources may make it difficult for the vision to succeed.

* Examination of environmental characteristics which the vision must allow the organization to cope with was successful in encouraging reflection on the vision, altering assumptions concerning the vision (transformational learning), and in identifying areas within the environment that the vision could not cope with. In particular, a split in the organization was identified as to whether environmental characteristics were related to youth-at-risk or traditional 4-H youth.

Conclusions and Recommendations

During the vision implementation process the organization should consider the differing perspectives held by different groups. The understandings of vision-related concepts need continuous refinement, examination and sharing within and between groups in order for a shared vision to be successfully developed. As Brooks (1989) cites Schwartz and Davis, in order to successfully implement a new program individuals within the organization must act consistently with the program. During the implementation of a new vision, this consistency cannot be accomplished if individuals do not understand the vision or if they do not have ownership or commitment over the vision.

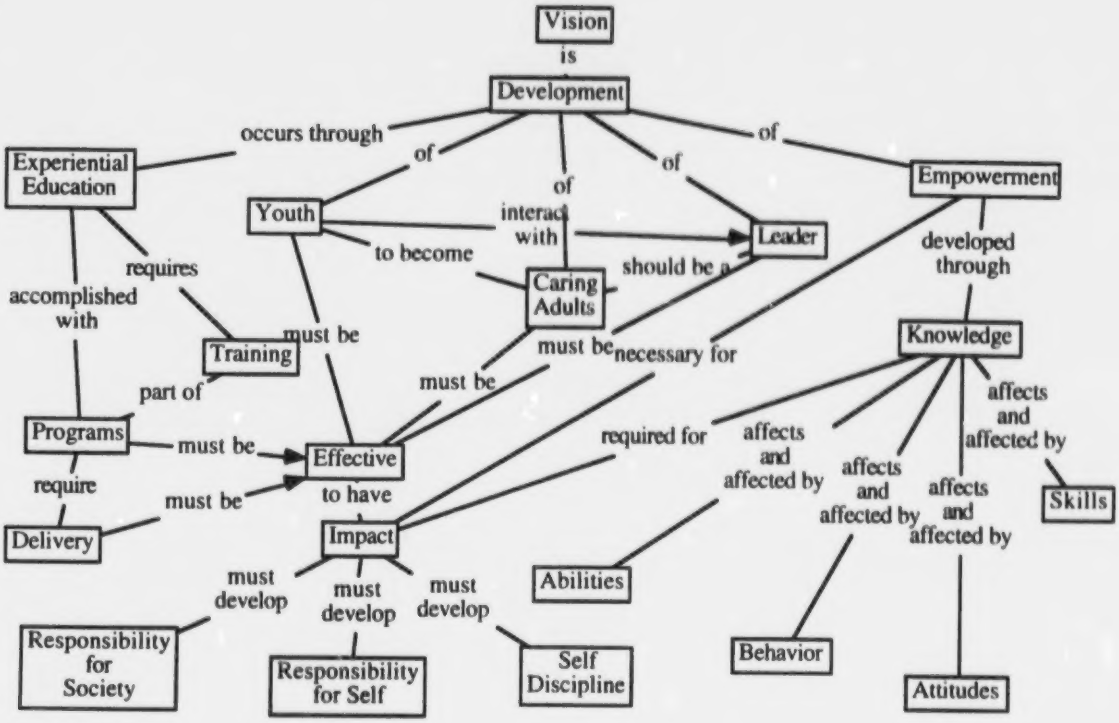

Vision
is
Development
occurs through
of
of
of
of
Experiential Education
Youth
interact with
Leader
Empowerment
to become
Caring Adults
should be a
developed through
requires
accomplished with
Training
must be
must be
must be
necessary for
Knowledge
part of
Programs
must be
Effective
required for
affects and affected by
affects and affected by
affects and affected by
affects and affected by
Skills
require
must be
to have
Delivery
Impact
must develop
must develop
must develop
Abilities
Responsibility for Society
Responsibility for Self
Self Discipline
Behavior
Attitudes

Figure 2
Concept Map-Shared Vision

Areas of agreement could be used by the organization as a launching point to further expand the vision implementation process. Areas of contention need to be further examined until an understanding is reached with which the majority of individuals in the organization can agree. In both cases concept maps could be useful to summarize and examine the perceptions of importance individuals attribute to each of these themes as well as to answer the question of why individuals feel the way they do.

Of particular interest to the organization is the identified conflict over the inherent nature of individuals as being lazy or more self-motivated and 'trustworthy.' Since empowerment in an organization has been determined to be a relationship built on trust (Kowalski, 1989), it is crucial that individuals within an organization are trusted and that they, in turn, trust others. Without this trust, empowerment cannot develop.

The development of a shared vision, as supported in the introduction, is crucial to organizational empowerment and adaptability. Additionally, existence of a shared vision enhances trust in the organization (Parsons, 1991) and facilitates employee empowerment. Existence of a shared vision increases self-direction and personal satisfaction (Murphy, 1987) and thus acts to raise the need level on Maslow's hierarchy. According to Bass as cited in Thompson (1989), this is one of the means by which empowerment can be achieved.

The fact that respondents generally preferred their own vision indicates the commitment that creation of a concept map develops in respondents. Commitment has been determined to be crucial to employee and organizational empowerment (Thompson, 1989) and to the implementation of a shared vision (Carl & Stokes, 1991).

The organization should continue to encourage individuals to develop concept maps in order to clarify perceptions of the vision, teach meaningful learning and therefore empower individuals, develop a visual representation of individual perceptions of the vision and to further develop commitment to the organization and to the meaning of the vision. These individual representations should continue to be used to test and refine the 'shared vision' as well as the themes of agreement or disagreement which emerged during the study.

The 4-H Youth Development Program in Cornell Cooperative Extension should continue to ask individuals whether the identified environmental characteristics are applicable to youth-at-risk or all 4-H youth . Individuals within the organization do not appear to share an under-standing of who are the organization's clientele. Additionally, a feeling exists that only if the organization is dealing with youth-at-risk are these characteristics important. Since the organization works in a societal climate characterized by these factors, it is crucial that all individuals understand the effects of these factors on clientele.

The organization needs to further examine the perceptions of individuals concerning the ability of the organization to cope with time pressure and lack of resources. Uncertainty on the part of respondents may lead to less motivation and therefore decrease the success of the organization.. Additionally, if existing perceptions of the vision of the organization will not allow the organization to successfully cope with these factors, it is critical that these perceptions of vision be altered to allow the organization to cope. Most importantly, the question should be asked, How could the vision be changed to better allow it to cope with existing environmental factors?

Overall, the process was successful in identifying and illustrating shared themes and therefore, in producing a base that can be used by the organization to further develop consensus and successfully implement the new organizational vision. Concept maps were useful in identifying and sharing perspectives on the vision and thus acting as a tool to enhance communication. Additionally, reflection and creation of concept maps resulted in an increased sense of commitment to the vision as well as agreement on a shared perspective of the vision.

References

Ausubel, D. P. (1968). Educational psychology: A cognitive view. New York: Holt, Rinehart and Winston.

Belenky, M. F., Clinchy, B. M, Goldberger, N. R., & Tarule, J. M. (1986). Women's ways of knowing: The development of self, voice and mind. New York: Basic Books.

Blanchard, K., Guest, R. H., & Hershey, P. (1985). Organizational change through effective leadership (2nd ed). New York: William Morrow and Company,

Block, P. (1987). The empowered manager. San Francisco: Jossey-Bass.

Brooks, A. K. (1989). Critically reflective learning within a corporate context [Doctoral dissertation. Teachers College. Columbia University. 1991], Dissertation Abstracts International, 50 ,(7).

Carl, J. & Stokes, G. (1991). Ordinary people, extraordinary organizations. Nonprofit World, 9(4), 8-12.

Deshler, D & Hagan, N. (1990). Adult education research: Issues and directions, in Merriam, S. B. & Cunningham, P. M. (Eds.), Handbook of adult and continuing education (pp. 147-167). San Francisco: Jossey-Bass.

Dillman, D. A. (1978). Mail and telephone surveys: The total design method. New York: John Wiley and Sons.

Ewert, D. M. (1990). Adult education and international development. In Merriam, S. B. & Cunningham, P.M. (Eds.), Handbook of adult and continuing education (pp. 84-98). San Francisco: Jossey-Bass.

Forest, L. B. (1990). The Cooperative Extension Service. In Merriam, S. B. & Cunningham, P. M. (Eds.), Handbook of adult and continuing education (pp. 332-343). San Francisco: Jossey-Bass.

Fowler, F. J. (1988). Survey research methods. California: Sage Publications.

Freire, P. (1970). Pedagogy of the oppressed. New York: Herder and Herder.

Gordon, J. (1991). A diagnostic approach to organizational behavior. Boston: Allyn and Bacon.

Greene, J. C., Caracelli, V. J., & Graham, W. (1989). Toward a conceptual framework for mixed-method evaluation designs. Educational Evaluation and Policy Analysis, 11(3), 255-274.

Guba, E. & Lincoln, Y. (1989). Fourth generation evaluation. California: Sage.

Kowalski, K. M. (1989). The components of empowerment from the perspective of successful leaders in business and education. [Doctoral dissertation, University of Pittsburgh], Dissertation Abstracts International, 51(2).

Merriam, S. B. & Caffarella, R. S. (1991). Learning in adulthood. San Francisco: Jossey-Bass.

Mezirow, Jack. (1990). How critical reflection triggers transformative learning. In Mezirow, J. and Associates (eds), Fostering critical reflection in adulthood: A guide to transformative and emancipatory learning. San Francisco: Jossey-Bass.

Murphy, J. P. (1987). College leadership: Sharing the vision. [Doctoral Dissertation, Stanford University] Dissertation Abstracts International, 48(7).

Newsom-Stewart, M. (1993). Developing shared meaning: Application of assimilation theory to 4-H, Cornell Cooperative Extension. Ph.D. Dissertation, Cornell University.

Newsom-Stewart, M. & Roellke, C. (1993). Report to the Provost's Task Force on Student Support Services. Ithaca, NY: Cornell University. February 1, 1993.

Novak, J. D. (1977a). A theory of education. New York: Cornell University Press.

Parsons, M. H. (1991). Enhancing teaching-learning environments: A change management strategy. Hagerstown Junior College, MD. Opinion Paper. (from ERIC Abstract ED 333926).

Patton, M. Q. (1990). Qualitative evaluation and research methods (2nd edition). California: Sage.

Smith, M. F. (1989). Evaluability assessment: A practical approach. Boston: Kluwer Academic Publishers.

Thompson, J. A. (1989). Bridge to the future: How elementary school principals share their visions. [Doctoral dissertation, Arizona State University]. Dissertation Abstracts International, 48(7).

Vaill, P. B. (1989). Managing as a performing art: New ideas for a world of chaotic change. San Francisco: Jossey-Bass.

DEVELOPMENT OF AN ACTION RESEARCH PROCESS TO EVALUATE AND IMPLEMENT A NEW VISION IN THE CORNELL COOPERATIVE EXTENSION 4-H YOUTH DEVELOPMENT PROGRAM

A Critique

Randol G. Waters, The University of Tennessee--Discussant

The purpose of this research was to "develop and evaluate a process to allow program planners... to evaluate existing perceptions of a new vision as it is being implemented." One of the first things which strikes me as I review this paper is the meticulous process the author uses to move the reader through the literature as she develops the theoretical framework. This is particularly helpful to those of us in the profession who are only beginning to gain a better understanding of and appreciation for "action research." Whether one views action research as "research" in the traditional sense, or simply a logical process of linking theory and practice, the processes of "action research," when utilized by skilled "action researchers" can tremendously help in an organizational renewal process such as that which is currently being undertaken in the Cooperative Extension System.

The author explains that she uses a "mixed method" as a basis for triangulating and clarifying results. Although this is certainly a worthy goal, I wonder whether the researcher was truly able to do this. I found myself wanting to read the "more detailed information which was published elsewhere." Were the findings in the quantitative survey substantiated in the concept maps and/or vise-versa? Were differences in such issues as "degree of top-down vs bottom-up involvement in education," "need for ownership over the educational process," "the use of teamwork," etc. able to be attributed to such variables as "gender," "position" and "length of time in the organization"? My only serious criticism of the paper is that more effort was spent in educating the reader with regard to the validity of the process and procedure than was spent in providing evidence of validity in findings.

Although it is not always a necessary purpose of action research, the author indicated a desire to "increase the generalizability of findings." A question I would pose is: Are the findings truly generalizable to the total population of 4-H stakeholders? What was the process for selecting participants in the concept mapping sessions? Were participants equally vocal in the development of the shared vision? What was the process for choosing persons to complete the written survey? What important differences (if any) exist between the 59% who chose to respond to the survey and the 31% who chose not to? Finally, is it really that important for findings to be generalized beyond those who participated in this process?

Findings from this study should help organizational leaders to better understand the complexity of the issues involved in organizational renewal. The recommendations developed by the author are based more upon a sound understanding of the literature than upon the findings. Nonetheless, they are appropriate for any organization in transition. Movement toward a common vision (and mission) is important to Extension's survival as a viable educational organization. I strongly agree with the author that "concept mapping" can play an important role in identifying areas of agreement and contention. There is an equally important role the process can play in moving closer to agreement in that vision.

RELATIONSHIPS BETWEEN OCCUPATIONS OF HOME-BASED WORKERS AND SELECTED DEMOGRAPHIC AND WORK CHARACTERISTICS

Marilyn M. Furry
Assistant Professor
Rama B. Radhakrishna
Research Associate
Department of Agricultural and Extension Education
The Pennsylvania State University

Introduction and Theoretical Framework

During the 1980s, economic and technological changes made home employment a viable option for many workers: 1) decline in costs of computers and telecommunications equipment, making way for more white collar workers to work at home; 2) change in the composition of labor force--increasing number of women with young children opting to work; 3) globalization of economic markets; and 4) removal of prohibitions on commercial home-based work (Masuo, Walker, & Furry, 1992). In 1993, 39 million people worked at home full- or part-time (Braus, 1993).

For many years, Cooperative Extension has recognized home-based work (HBW) as a priority program. Home-based work is a part of four national initiatives of the Cooperative State Research Service and USDA-ES: 1) revitalizing rural America; 2) family and economic well being; 3) alternative agricultural opportunities; and 4) rural family and community well-being. Furthermore, home-based work is also regarded as a community tool, a means of increasing the household income of financially distressed farm families while keeping them in rural and smaller communities (Norum & Weagely, 1985).

According to a traditional perspective, the occupation crafts and arts are common to individuals who primarily work at home (Littrell, Stout & Reilly, 1991). Home knitting was studied as a specific job appropriate for home-based work (Loker, 1985). Child care, contracting, and the field of sales, also have been thought as ideal for home employment (Arden, 1988).

A number of studies have examined the status of home-based workers (HBWs) and the occupations pursued by them. The occupations range from mail order business to computer programming and other work involving men and machine. According to Bureau of Labor Statistics, there were 18 million HBWs, of these 55% held jobs in managerial and professional occupations, 29% in technical sales and administrative support, less than 10% were engaged in production, craft and repair jobs and finally 3% were working as operators, fabricators and laborers (Horvath, 1986). Christensen (1988) found most of women HBWs located in clerical work (typing, bookkeeping, and data entry); crafts work (sewing, knitting, embroidery); and professional occupations (accounting, teaching/tutoring and writing).

Loscocco, Robinson, Hall and Allen (1991) in a study of small businesses in New England found that business services and manufacturing were the key industries where both men and women were located. Women were represented heavily in business services, and they averaged lower sales volume and income from small businesses than their male counterparts.

In the above paragraphs, we have briefly discussed both the traditional and contemporary perspectives regarding occupations pursued by HBWs. This review suggests that the variety of jobs of work performed by HBWs expands assumptions about work suitable for the home. What occupations do HBWs pursue? and what relationships exist between occupations pursued by HBWs and their demographic and work characteristics were the foci of the research reported in this paper.

Purpose and Research Questions

The major purpose of this paper was to identify the types of occupations pursued by HBWs, and to determine any relationships/differences that may exist between types of occupations pursued by HBWs and selected demographic and work characteristics. The research questions used to guide the study included:

1. What are the types of occupations pursued by home-based workers?

2. What relationships/differences exists between the types of occupations pursued by HBWs and: 1) gender; 2) age; 3) education level; 4) place of residence; 5) home ownership; 6) business ownership; 7) years lived in the community; 8) experience in home-based work; and 9) income earned from HBW.

3. What marketing strategies do HBWs use to promote their products or services?

Methodology

The sample for this study consisted of 899 randomly selected home-based worker households in nine states: Hawaii, Iowa, Michigan, Missouri, New York, Ohio, Pennsylvania, Utah and Vermont. This sample was selected from a list of the nine state's household telephone numbers that were obtained from Survey Sampling Inc. of Fairfield, Connecticut. The Iowa State University Statistical Laboratory made screening calls to identify households containing at least one home-based worker. The criteria for selecting HBWs was a person at least 18 years of age who worked in or from home to earn income for a minimum of 312 hours over a year's time. Telephone interviews were conducted with the home-based workers in 899 households earlier identified as containing at least one home-based worker.

A structured survey instrument was developed to collect data for the study. The instrument was designed to obtain information on three characteristics: HBWs, the employment situation of the HBWs, and the households in which they lived. Data were collected by telephone interviews. Data were analyzed using descriptive statistics and were weighted to correct variances in the raw data from the population of HBWs in the nine states. Chi-square analysis and ANOVA was used to determine relationships/differences between occupations pursued by HBWs and selected demographic and work characteristics.

Findings

Demographic, Business and Work Profile

The selected demographic, business and work profiles of HBWs are presented in Table 1. Of the 899 HBWs interviewed, there were more men (58%) than women (42%). The mean age of HBWs in this study was 43.6 years, with a median age of 41 years. Home-based workers in this study, on an average had 13.9 years of schooling. The median years of schooling was 13.0. Most HBWs owned their homes (87%), married (85%), owned their businesses (74%), located their businesses in an urban area (54%), worked full time (72%) and lived in the same community for an average 20 years. Home-based workers reported an average 9 years of experience in HBW and earned an income of $17,836 from HBW.

Occupations

Home-based workers in this study pursued a variety of occupations. The occupations pursued by HBWs were classified in a manner consistent with other reports, based on U.S. Department of Commerce's (1980) Standard Occupational Classification Manual. There were nine

Table 1
Selected Demographic and Work Characteristics of Home Based Workers (n=899)

Characteristic	Discrete Variables (%)[a]	Continuous Variables (Mean)[a]
Gender		
Female	41.9	-
Male	58.1	-
Age	-	43.6 years
Years in School	-	13.9 years
Business Location		
Rural	46.1	-
Urban	53.9	-
Home Ownership		
Own Home	87.3	-
Not Own Home	12.7	-
Business Ownership		
Business Owners	74.6	-
Wage Worker	25.4	-
Years in Community	-	19.8 years
Employment Status		
Full-time	72.0	-
Part-time	28.0	-
Years in Home-based Work	-	9.1 years
Income from HBW	-	$17,921.38

[a] weighted percentages and means

categories used: 1) professional and technical, 2) marketing and sales, 3) clerical and administrative support, 4) mechanical and transportation, 5) services, 6) agricultural products and sales, 7) management, 8) contracting, and 9) crafts and arts. See Chart I for description of specific occupation categories.

No one occupational group was dominant (Table 2). However, marketing and sales had the highest number with 24 percent of workers, followed by contracting (15%), mechanical and transportation (13%), professional and technical (12%), arts and crafts (12%) services (12%), clerical and administration (6%), managerial and agricultural products and sales (3% each). Further examination of the occupation variable indicated that home-based workers pursued both traditional and contemporary occupations such as tax preparation, engine rebuilding, wood working, mail order business, computer programming, financial consultant, data processing and market research.

CHART I
LIST OF OCCUPATIONS PURSUED BY HOME-BASED WORKERS

Marketing & Sales:	Avon and door to door sales, flea market sales, real estate, mail order business, insurance and auto leasing agents.
Contracting:	Carpenters, house painting, road and other construction, electricians, roofers, and masons.
Mechanical & Transportation:	Truck and bus drivers, locksmiths, radio and television repairers, structural and electrical inspectors.
Services:	Beauticians, pet groomers, hairdressers, day care and child care providers, housekeepers, house and office cleaners and caterers.
Professional and : Technical	Computer consultants, lawyers, therapists, teachers of art and music, college tutors, accountants, architects and consultants.
Arts and Crafts:	Crafts, potters, blacksmiths, clothing designers, weavers, jewelry makers and musicians.
Clerical and Administrative Support:	Secretaries, bookkeepers, computer label makers, data processors, office managers, tax preparers and real estate appraisers.
Managerial:	Real estate managers, cleaning businesses, motels, rental property managers and special events coordinators.
Agricultural Products & Sales:	Herb, flower and egg sales, meat processing workers, and fisherman.

Table 2
Occupations Pursued by Home-based Workers (n=899)

Occupation	Frequency*	Percent*
Agricultural Products and Sales	24.2	2.7
Clerical and administration	52.6	5.8
Contracting	133.5	14.9
Crafts and Artisans	104.7	11.6
Managerial	31.1	3.5
Marketing/Sales	218.2	24.3
Mechanical/Transportation	118.4	13.2
Professional/Technical	107.3	11.9
Services	108.9	12.1

* weighted numbers and percentages

Relationships

Significant positive relationships were found between occupations pursued by HBWs and gender (X^2=3560.15; p=.000; Cramer's V=0.62), business ownership (X^2=194.40; p=.000; Creamer's V=.46), business location (X^2=29.32; p=.000; Cramer's V=0.18), and home ownership (X^2=40.71; p=.000; Cramer's V=0.21) (Table 3). A higher percentage of men were employed in occupations such as professional and technical, mechanical and transportation and contracting. On the other hand, women home-based workers were employed in clerical and administrative jobs, services, marketing and sales, and arts and crafts. A higher proportion of business owners were employed in contracting, mechanical and transportation, services, and arts and crafts type of occupations, while higher percentage of wage workers were employed in marketing and sales type of occupations. With the exception of agriculture and sales and arts and crafts, most HBWs located their businesses in an urban area. A higher percentage of HBWs owned their homes regardless of occupations pursued. Further, almost all HBWs who were employed in agricultural and sales, owned their home.

Table 3
Results of Crosstabulations of "Occupations" by Selected Demographic Characteristics.

Characteristic	Cramer's V	Chi-Sq	Probability
Gender	0.624	350.155	0.000
Business ownership	0.465	194.404	0.000
Business location	0.181	29.321	0.000
Home ownership	0.213	40.716	0.000

Significant differences were found between age, education level, experience in HBW, years lived in the community, net business income, and occupations pursued by HBWs (Table 4). Older HBWs were likely to be in agricultural products and sales type of occupations while younger HBWs were most likely to be located in service, contracting and managerial types of occupations. Home-based workers who were employed in professional and technical type of occupations were the ones who had highest education (16 years of schooling) while services was the occupation where HBWs tend to have fewer years of schooling (12.9 years). It appears that HBWs in mechanical and transportation and agricultural products and sales type of occupations tend to have stayed in the same community for a longer time (24 years) than HBWs in professional and technical type of occupations (14.9 years). Home-based workers pursuing agricultural products and sales are the ones who have most experience (13.5 years) followed by mechanical and transportation (12.4 years). Home-based workers with little experience tend to pursue service type of occupations. Home-based workers pursuing marketing and sales type of occupations reported the highest income from HBW ($28,956), followed by clerical and administration ($24,322) and contracting ($19,571), while services was the occupation, where HBWs earned less income from HBW ($4,061).

Marketing Strategies

Home-based workers were asked about the various marketing strategies they used to promote their business. As high as 94% relied on word-of -mouth or referrals, newspapers (29%), yellow pages (18%), direct mail (14%) and catalogs (10%). In regard to selling their products, 88% sold in their own states. A similar percent of HBWs bought most of their business supplies in their own states.

Table 4. ANOVA Results for Occupations Pursued by Home-based Workers and Demographic/Work Characteristics

	Demographic/Work Characteristics				
Occupation Category	Age	Years of Schooling	Experience in HBW	Years lived in Community	Income from HBW
Agricultural products and sales	49.15**A**	13.44**CD**	13.55**A**	24.23**A**	$8,051**FE**
Clerical and administration	43.55**BC**	14.00**BC**	10.25**BC**	18.00**DEC**	$24,322**BA**
Contracting	40.45**C**	13.13**D**	9.81**BCD**	21.40**BDAC**	$19,571**BC**
Crafts and artisans	43.30**BC**	14.07**BC**	8.21**CD**	16.53**DE**	$10,889**DE**
Managerial	41.10**C**	13.82**BC**	8.94**CD**	25.41**A**	$13,042**DCE**
Marketing and sales	42.10**BC**	14.13**B**	7.87**CD**	18.93**BDEC**	$28,956**A**
Mechanical and transportation	46.00**BA**	12.81**D**	12.40**BA**	24.79**BA**	$13,839**DCE**
Professional and technical	43.30**BC**	16.00**A**	8.64**CD**	14.93**E**	$15,973**DC**
Services	40.10**C**	12.88**D**	7.19**D**	21.82**BAC**	$4,061**F**
df	8	8	8	8	8
F	3.19	21.78	4.56	4.37	13.92
p	< .0001	< .0001	< .0001	< .0001	< .0001

Means with the same letters are not significantly different.

A variety of marketing methods were employed. Direct sales to consumers who come to the owner's home was the most popular method used (42%). Direct sales away from the owner's home was also a common method (32%). Bazaars, fairs, and shows (16%), consignment (13%), sales representatives (10%) and mail order catalogues (8%) were other marketing methods used.

Conclusions and Recommendations

This study has provided baseline information on home-based work. For present and potential HBWs, the findings are indicative of possible employment opportunities and realistic earnings from HBW. Findings also suggest vast potential for educational programming in HBW.

Home-based workers pursued a variety of occupations. Predominant among them were marketing and sales, contracting, mechanical and transportation, professional and technical, crafts and arts and service which together accounted for more than two-thirds of the occupations pursued by HBWs.

Gender, age, educational level, business ownership, business location, home ownership, experience in HBW, years lived in the community, and income from HBW and occupations pursued by HBWs are related.

Home-based workers used a variety of marketing strategies to promote their products or services. However, it appears that they rely upon traditional marketing strategies to market their products, and marketing operations are limited to local areas.

Results from this study and several other studies reveal more men working at home. Further research is needed to document factors such as knowledge, entrepreneurial values, role models and or financial resources that influence women to enter HBW.

It appears that HBWs have strong ties with their communities as revealed by home ownership (87%) and living in the same communities for a longer period of time (19.8 years). It is possible that a successful home-based business relies on community resources while communities need independent home workers for economic development and stability. Community resources needed to support HBW are to be identified and enhanced.

Rural communities in some mid-western states are aggressively recruiting home-based telecommuting enterprises as a type of economic development. These home-based businesses make a significant contribution to the local economy without requiring the tax subsidies that a new corporate may demand. Further, LINK reported the average 1992 income for households with a home-based worker was $50,200.

Educational programs incorporating research outcomes must emphasize the merits and barriers of establishing and managing a home-based business. Cooperative extension in counties, rural development centers and financial institutions through educational programs can help individuals to identify realistic opportunities in home employment and the relative income earned from a variety of home-based jobs. Further research is needed to examine additional factors that contribute to the success of home-based businesses.

Production and marketing information can be delivered to HBWs through innovative educational methods. Extension educators also can develop educational programs helping individuals identify additional market opportunities for home-based products and services beyond their states. These include market information, and advertising and sales promotion. In addition, the possibility of using courier services, toll-free numbers and other telecommunication equipment that enhance accessibility of customers nationwide should be explored.

Agricultural and extension educators as they work with young and older people to understand the changes in the rural and farm communities should help them recognize the impact of at-home-income generation to community stability. Economic and demographic trends favor home-based businesses which may encourage more households not to leave rural areas. Actually some families may return to rural communities contributing to the revitalization and growth of the communities.

As indicated earlier, HBW is a part of four national initiatives. For extension, HBW provides a range of opportunities. Extension educators can target their programming efforts toward HBW as another option for earning income when family structure or employment change. Such programming efforts should help audiences to identify opportunities and limitations of HBW. Further, the findings should help identify and support extension's role in the interface between HBW and family life.

References

Arden, L. (1988). The work-at-home source book: How to find "at-home" work that's right for you. Boulder, CO: Live Oak Publications.

Braus, P. (1993). Homework for Grownups. American Demographics, 15(8), 38-43.

Christensen, K. (1988). Women and home-based work: The unspoken contract. New York: Henry Holt.

Horvath, F. W. (1986). Work at home: New findings from the current population survey. Monthly Labor Review, 109(11), 31-35.

Littrell, M. A., Stout, J., & Reilly, R. (1991). In-home businesses: Profiles of successful and struggling craft producers. Home Economics Research Journal, 20, 27-39.

Loker, S. (1985). Home knitters design nontraditional lives. Vermont Science, 9(2), 3.

Loscocco, K. A., Robinson, J., Hall, R. H., & Allen, J. K. (1991). Gender and small business success: An inquiry into women's relative disadvantage. Social Forces, 70(1), 65-85.

Masuo, D. M., Walker, R., & Furry, M. M. (1992). Home-based workers: Worker and work characteristic. Journal of Family and Economic Issues, 13(3), 245-262.

Norum, P. S. & Weagely, R. O. (1985). Home-based work=home economics. In K. P. Schnittgrund (Ed.), American Council on Consumer Interests 31st Annual Conference: Proceedings, 25-26.

RELATIONSHIP OCCUPATIONS OF HOME-BASED WORKERS AND SELECTED DEMOGRAPHIC AND WORK CHARACTERISTICS

A Critique

R ndol G. Waters, The University of Tennessee--Discussant

This study contributes to the development of a more contemporary demographic profile of the home-based business person. The authors are to be commended for attempting to learn more about this rapidly growing population of workers in an effort to present a more realistic picture of the home-based business outlook to those interested in pursuing such careers. The literature review, although somewhat brief, adequately supports the idea that home- based business demographics are not static. There is a need to continually assess this dynamic area of employment.

There are a few methodological issues which the authors should address to improve the paper. The first issue centers around a need to clearly identify the population to which the authors are attempting to generalize their findings. What is the population? Why was a sample of 899 participants selected? Why draw them from only these nine states? Further, what are the "weighted" means and percentages reported in Table 1? Are these values simply corrected to reflect the expected value in the population? If so, it would be more informative to provide both weighted and unweighted means. Regarding the discussion of the relationships displayed in the crosstabulation table (Table 3), what is a significant "positive" relationship? The discussion of the results of the Chi Square are somewhat vague. It would be much more helpful to have included more traditional tables of frequencies and percentages to describe these relationships. (I'm sure that page limitations placed some limits upon your ability to present tabular data. However, adequate descriptive information must be provided in support of your discussion.) Finally, although the findings are fairly clear and straight forward, a number of editorial revisions and clarifications would enhance the paper.

This paper provides the basis for a very good discussion of home-based business opportunities with the burgeoning entrepreneur. However, I would pose the following questions to the authors with the opinion that answers to them may improve the study even more.

1) Why do you suppose your findings regarding the distribution of employment across SIC categories were so much different than those quoted in your literature from the Bureau of Labor Statistics? (i.e., How representative is your sample to the population from which it was drawn?)

2) Regarding the household income quote from LINK, how do their data support yours? Do they have data reporting the average household income for those households without HBBs? If so, how does the difference between these two figures compare to the overall average income from your study? (If these two averages are comparable, you have additional data in support of the generalizability of your study.)

3) Does "years of schooling" relate to "income from HBBs"? If so, does it interact with occupational category?

In summary, the study provides a good contribution to the literature about home-based businesses. Although some editorial revisions of the paper itself are in order, I commend the authors for their work.

NAERM Third Session
10:30 a.m.-12:00 noon
Concurrent Session G

Theme: Beginning Teacher Competencies, Student Teaching Requirements, Pilot Agriscience Courses, and Educational Competency Levels

Topic 1: Inservice education needs of teachers of pilot agriscience courses in Mississippi

Speakers: Michael Newman, Donald Johnson (Mississippi State University)

Topic 2: Comparing levels of competence of occupational educators in their ability to carry out professional teaching competencies

Speaker: Vernon Luft (University of Nevada-Reno)

Topic 3: A national study of student teaching requirements in agricultural education

Speaker: Jacquelyn Deeds (Mississippi State University)

Topic 4: Perceptions of critical competencies for the survival of beginning agriculture and home economics teachers from four educational perspectives

Speakers: Laurie Nichols, John Mundt (University of Idaho)

Discussant: Gary Straquadine (Utah State University)

Chairperson: Gary Briers (Texas A&M University)

Facilitator: Lou Riesenberg (University of Idaho)

INSERVICE EDUCATION NEEDS OF TEACHERS OF PILOT AGRISCIENCE COURSES IN MISSISSIPPI

Michael E. Newman
Assistant Professor
Agricultural and Extension Education
Mississippi State University

Donald M. Johnson
Assistant Professor
Agricultural and Extension Education
Mississippi State University

Introduction

Teachers of agriculture continually want and need inservice education, particularly in technical subject matter (Barrick, Ladewig, & Hedges, 1983). Logically, this need is more pronounced when the teachers are asked to teach new subject matter or subject matter in which they have had little previous training. In developing an inservice education program, assessing learner needs is an important early step in the process. Involving the learners in the process of planning an inservice education program increases the likelihood of implementing relevant programs (Waters & Haskell, 1989).

Tyler (1971) defined a need as a difference between a present condition and an acceptable norm. This definition serves as the basis for the discrepancy model of assessing learner needs. One discrepancy model, developed by Borich (1980), is commonly used in educational settings and is appropriate for assessing inservice education needs of teachers (Barrick et al., 1983). In this study, the researchers used the Borich model to assess the inservice education needs of teachers of pilot agriscience courses in Mississippi. Background information about the pilot courses and a discussion of the appropriateness of the use of the Borich model for assessing inservice education needs is provided below.

In 1988, the National Research Council (NRC) reported that "much of the focus and content of many vocational agriculture programs is outdated" (p. 3). The NRC recommended that agricultural educators move quickly to upgrade the scientific and technical content of the curriculum. Mississippi agricultural educators responded to this recommendation by developing two pilot courses in agriscience for the 1991-92 school year. One course, Introduction to Agriscience, was designed as a one-hour, 9th or 10th grade level course. The other, Agriscience I, was designed as a two-hour, 11th or 12th grade level course. A third course, Agriscience II, was designed as a two-hour, 11th or 12th grade level course. Agriscience II was implemented during the 1992-93 school year. In a report on the development of the courses, Johnson (1991) stated, "The courses were designed to teach the scientific principles which form the basis of the modern food and fiber industry and to provide students with active, hands-on learning experiences which emphasize the scientific method in the study of agriculture" (p. 1).

Agricultural education supervisory staff members of the Mississippi State Department of Education selected 42 teachers (employed in 41 secondary schools) to pilot-test the new agriscience courses for a three-year period. The schools and teachers were selected so as to be representative of schools and teachers offering secondary agricultural education programs in Mississippi (J. W. Jones, assistant state supervisor, personal communication, June 10, 1991). During June 1991, a two-week, intensive inservice workshop was held for teachers selected to teach the new agriscience courses.

During the first year of the pilot test, the courses were well-received. Agriculture teachers, school administrators, guidance counselors, and science teachers all strongly support the courses and agree that science credit should be awarded for the course (Johnson & Newman, 1992; Newman & Johnson, 1992).

Using the Borich model results in a framework for practical decision making. Barrick et al. (1983) concluded that the Borich model is a defensible method of assessment of teacher inservice education needs--better "than a survey of desires or felt needs" (p. 19). The Borich model's use of weighted discrepancy scores to determine needs of learners usually yields results that are different from those that would be obtained by more traditional means of needs assessment or from those identified by using the importance ratings (Barrick et al., 1983; Barrick & Powell, 1986; Waters & Haskell, 1989).

In the Borich model, the teachers surveyed provide an evaluative judgment about the importance of competencies and their own performance in these areas (Borich, 1980). The attempt of the design is to determine the "congruence between what the teacher should be able to do and what the teacher can do" (Borich, 1980, p. 42).

Purpose and Objectives

The overall purpose of this research was to identify and assess the inservice education needs of teachers who teach the pilot agriscience courses in Mississippi and to determine their need for additional instructional materials. The results of the study were used to plan and implement an inservice education program to help meet these needs. The specific objectives of the study were to:

1. Determine the teachers' perceptions of the importance of the various units taught in the courses and their personal level of competence in each unit;

2. Determine the need for inservice education on the agriscience units based on the Borich model of assessing needs; and

3. Determine the units for which teachers perceive additional instructional materials are needed.

Procedures

The design of the study was descriptive-survey. The population for the study was 39 teachers of pilot agriscience courses in Mississippi. Three of the original teachers in the pilot program were excluded because of resignations and retirements and replacements had not yet been put in place.

A mailed questionnaire was used to collect the data. Questionnaires were mailed to the 39 teachers in October, 1992 with a stamped, self-addressed, return envelope. One follow-up mailing was conducted 10 days after the original mailing. Thirty-one of the 39 teachers returned questionnaires for a response rate of 79.5%. Two responses were deemed to be unusable because of response set and incomplete data, resulting in a usable response rate of 74%.

Chi-square tests used to compare early and late respondents on their ratings of the units on importance and competence to determine if a possible nonresponse bias existed were not significant. The researchers concluded that nonresponse bias was not a threat to the study (Miller & Smith, 1983).

The instrument used for the study was designed by the researchers. As the competency areas to be rated, it contained the 40 units taught in the three pilot agriscience courses, with the mandatory objectives for each unit listed to further clarify the subject matter within each unit. The instrument was reviewed by a panel of experts consisting of agricultural education faculty and graduate students to establish content validity.

A pilot test was conducted with six preservice agricultural education teachers for the purpose of establishing test-retest reliability (coefficient of stability). The students were asked to complete the questionnaire and then asked to complete it again after 14 days. Based on the procedures outlined by Ferguson (1976), Pearson product-moment correlations for each competency were calculated and standardized by converting them to Fisher's Z scores. Then a mean Fisher's Z score was computed and converted to a Pearson product-moment correlation for the overall reliability score. The coefficient of stability for the instrument was .76.

Findings

The teachers were asked to rate the importance of the units and their level of competence in the subject matter contained in each unit in the courses which they were currently teaching. Twenty-nine teachers rated the competencies in the Introduction to Agriscience. For the Agriscience I course, 14 teachers rated the competencies. For the Agriscience II course, 7 teachers rated the competencies. (Several of the teachers were teaching two or all three courses.) Teachers rated the importance of the unit using the following scale: 1 = very unimportant, 2 = unimportant, 3 = average importance, 4 = important, 5 = very important. They rated their competency in each unit using the following scale: 1 = very low, 2 = low, 3 = average, 4 = high, 5 = very high. The competency ratings and importance ratings are summarized in Table 1.

Weighted discrepancy scores were calculated for each respondent for each of the units by subtracting the competence rating from the importance rating and multiplying the result by the importance rating (Borich, 1980). Mean weighted discrepancies were calculated for each unit by dividing the sum of the weighted discrepancy scores for the unit by the number of observations (Borich, 1980). Scores ranged from -2.87 to 9.00.

For Introduction to Agriscience and Agriscience I, the biotechnology, computer technology, and mechanical technology units, in order, had the highest mean weight discrepancies were environmental technology, aquaculture, and physical technology. The mean weighted discrepancy scores are presented by agriscience course in Table 2.

Teachers were also asked if additional instructional materials were needed for each unit. In Introduction to Agriscience, more teachers perceived computer technology (100.0%) and mechanical technology (96.6%) to be in need of additional materials. In Agriscience I, biotechnology (100.0%) was highest, followed by computers (92.9%) and mechanical technology (92.9%). In Agriscience II, environmental technology, aquaculture, physical technology, and food and fiber science all had 100% of the teachers reporting a need for more materials. Table 3 contains the results for each course.

Table 1

Teacher Perceptions of Importance of and Personal Competence in Units from Agriscience Courses

Course/Unit	Competence $\overline{X}$	Competence SD	Importance $\overline{X}$	Importance SD
Introduction to Agriscience (n=29)				
Human Relations/Leadership	4.40	.72	4.04	1.14
Principles of Animal Science	4.33	.71	4.07	1.15
Principles of Plant Science	4.30	.70	4.18	1.06
Principles of Soil Science	4.17	.70	4.11	.99
Introduction to Agriscience	4.10	.80	4.03	1.04
Supervised Agricultural Experience	4.10	.76	3.82	1.25
Opportunities in Agriscience	4.00	.70	4.04	1.04
Principles of Food and Fiber Science	3.63	.81	3.89	1.03
Issues in Environmental Quality	3.63	.85	4.07	1.05
Principles of Entomology	3.57	.90	.93	.94
Computers	3.50	1.08	4.17	1.10
Application of the Scientific Method	3.40	.86	3.89	1.10
Mechanical Technology	3.40	.89	4.04	1.08
Introduction to Biotechnology	3.03	.88	4.00	1.04
Agriscience I (n=14)				
Soil Science Technology	4.21	.70	4.39	.51
Animal Science Technology	4.14	1.10	4.31	.95
Human Relations/Leadership	4.14	.54	4.00	.91
Plant Science Technology	4.07	.92	4.39	.65
Introduction to Agriscience	3.93	.83	3.93	.49
Supervised Agricultural Experience	3.93	.92	3.77	1.09
Application of the Scientific Method	3.79	.80	4.23	.44
Principles of Fiber Science	3.71	.99	3.77	1.01
Natural Resource Technology	3.71	.99	4.15	.80
Computers	3.64	.84	4.31	.63
Principles of Entomology	3.57	1.02	4.23	.44
Opportunities in Agriscience	3.56	.73	4.25	.71
Mechanical Technology	3.36	1.08	4.15	.38
Biotechnology	3.07	1.00	4.39	.71
Agriscience II (n=7)				
Soil Science Technology	4.43	.54	4.83	.41
Communication Skills	4.29	.49	4.67	.52
Plant Science Technology	3.86	1.07	4.83	.41
Supervised Agricultural Experience	3.67	1.03	3.71	1.38
Mechanical Technology	.50	1.22	4.20	.45
Entomology	3.29	.76	4.33	.52
Food and Fiber Industry	3.29	1.11	4.00	1.55
Environmental Technology	3.29	1.25	4.83	.41
Entrepreneurship	3.17	.75	4.00	.58
Aquaculture	3.00	.89	4.57	.54
Computer Usage	3.00	.63	4.00	1.41
Physical Technology	2.71	.95	4.33	.82

Note. Competence scale: 1=very low, 2=low, 3=average, 4=high, 5=very high.

Note. Importance scale: 1=very unimportant, 2=unimportant, 3=average importance, 4=important, 5=very important.

Table 2
Mean Weighted Discrepancy Scores for Units of Agriscience Courses.

Course/Unit	$\overline{X}$	SD
Introduction to Agriscience (n=29)		
Introduction to Biotechnology	5.069	5.418
Mechanical Technology	3.615	4.834
Computers	3.464	.943
Issues in Environmental Quality	3.036	4.765
Application of the Scientific Method	2.786	4.077
Principles of Entomology	2.393	4.012
Principles of Food & Fiber Science	2.036	3.437
Opportunities in Agriscience	1.036	3.249
Principles of Soil Science	.821	3.518
Principles of Plant Science	.607	3.900
Introduction to Agriscience	.357	3.153
Supervised Agricultural Experience	.176	3.312
Principles of Animal Science	.036	3.097
Human Relations/Leadership	-.286	3.740
Agriscience I (n=14)		
Biotechnology	6.538	6.540
Mechanical Technology	3.769	5.747
Computers	3.692	4.889
Opportunities in Agriscience	3.500	3.780
Principles of Entomology	3.385	4.501
Application of the Scientific Method	2.231	4.764
Plant Science Technology	2.154	5.047
Natural Resource Technology	2.077	3.883
Principles of Fiber Science	1.000	4.203
Animal Science Technology	.846	3.671
Soil Science Technology	.846	3.693
Supervised Agricultural Experience	.769	5.069
Human Relations/Leadership	.077	3.818
Introduction to Agriscience	.077	3.174
Agriscience II (n=7)		
Environmental Technology	9.000	6.000
Aquaculture	8.167	6.178
Physical Technology	8.167	4.309
Computer Usage	6.000	5.831
Entomology	5.333	5.046
Plant Science Technology	5.000	6.325
Mechanical Technology	4.200	4.025
Food & Fiber Industry	4.000	3.742
Entrepreneurship	3.500	3.674
Communication Skills	2.500	2.739
Supervised Agricultural Experience	2.000	6.481
Soil Science Technology	1.667	2.582

Note. Competence scale: 1=very low, 2=low, 3=average, 4=high, 5=very high.
Note. Importance scale: 1=very unimportant, 2=unimportant, 3=average importance, 4=important, 5=very important.

Table 3
Teacher Perceptions of Need for Additional Instructional Materials for Agriscience Units.

Course/Units	Additional Materials Needed?	
	Frequency Yes	Percent Yes
Introduction to Agriscience (n=29)		
Computers	29	100.0
Mechanical Technology	28	96.6
Application of the Scientific Method	25	86.2
Issues in Environmental Quality	24	82.8
Principles of Entomology	24	82.8
Principles of Food & Fiber Science	24	82.8
Principles of Plant Science	22	75.9
Opportunities in Agriscience	20	69.0
Principles of Soil Science	17	58.6
Principles of Animal Science	17	58.6
Human Relations/Leadership	16	55.2
Introduction to Biotechnology	13	44.8
Introduction to Agriscience	13	44.8
Supervised Agricultural Experience	13	44.8
Agriscience I (n=14)		
Biotechnology	14	100.0
Mechanical Technology	13	92.9
Computers	13	92.9
Principles of Entomology	12	85.7
Application of the Scientific Method	11	78.6
Natural Resource Technology	11	78.6
Plant Science Technology	10	71.4
Principles of Fiber Science	10	71.4
Introduction to Agriscience	10	71.4
Animal Science Technology	10	71.4
Opportunities in Agriscience	9	64.3
Soil Science Technology	9	64.3
Supervised Agricultural Experience	8	57.1
Human Relations/Leadership	7	50.0
Agriscience II (n=7)		
Environmental Technology	7	100.0
Aquaculture	7	100.0
Physical Technology	7	100.0
Food & Fiber Industry	7	100.0
Entomology	6	85.7
Plant Science Technology	6	85.7
Entrepreneurship	6	85.7
Mechanical Technology	6	85.7
Soil Science Technology	6	85.7
Computer Usage	5	71.4
Supervised Agricultural Experience	4	57.1
Communication Skills	3	42.9

Conclusions and Recommendations

Teachers of the pilot agriscience courses thought the units in the three courses were important and considered themselves competent in most of the units. Although the need for inservice education was not exceptionally high (possibly due to the teachers having participated in a workshop designed to prepare them to teach the courses in Summer 1991), the model consistently identified units where the level of competence was not on a par with the level of importance of the unit.

Teachers perceived themselves more competent in the traditional areas of animal science, plant science, soil science, supervised agricultural experience, and leadership development than in the not-so-traditional areas of computers, biotechnology, mechanical technology, entomology, environmental science, and aquaculture. The undergraduate curriculum probably should be restructured to provide more preparation in these areas.

The three most pressing needs for inservice education were in the areas of biotechnology, computers, and mechanical/physical technology. These units were rated highly in all three courses. Deficiencies were also identified in the areas of entomology, environmental sciences, and application of the scientific method. Teachers of the two advanced courses also need instruction in aquaculture and plant science. Based on the results of this study, inservice education programs have been designed to meet the needs of teachers in these areas.

The teachers perceived a dearth of instructional materials for the units included in the course, especially in computers, biotechnology, mechanical technology, environmental sciences, aquaculture, and entomology. Teachers perceived that more instructional materials were available for the more traditional units such as human relations/leadership, animal science, plant science, supervised agricultural experience, and soil science; but, for most units, teachers still felt they needed more instructional materials. Especially strong needs were indicated for computers, biotechnology, environmental technology, aquaculture, physical technology, and food and fiber industry. Proposals for the development of appropriate instructional materials have been submitted for funding.

Rankings of the units based on the mean weighted discrepancy scores were quite different from rankings of the units based solely on importance or competence. This supports the conclusions reached by Barrick et al. (1983) and Waters and Haskell (1989).

References

Barrick, K. R., Ladewig, H. W., & Hedges, L. E. (1983). Development of a systematic approach to identifying technical inservice needs of teachers. The Journal of the American Association of Teacher Educators in Agriculture, 21(1), 13-19.

Barrick, K. R. & Powell, R. P. (1986). Assessing needs and planning inservice education for first-year vocational agriculture teachers. Proceedings of the Thirteenth Annual National Agricultural Education Research Meeting. Dallas: American Association of Teacher Educators in Agriculture.

Borich, G. D. (1980). A needs assessment model for conducting follow-up studies. The Journal of Teacher Education, 31(3), 39-42.

Ferguson, G. A. (1976). Statistical analysis in psychology and education (4th Ed). New York: McGraw-Hill.

Johnson, D. M. (1991). Inservice workshop for instructors teaching pilot agriscience courses. (Final Project Report). Mississippi State: Mississippi State University, Department of Agricultural and Extension Education.

Johnson, D. M. & Newman, M. E. (1992). Perceptions of administrators, guidance counselors, and science teachers concerning pilot agriscience courses. Proceedings of the Nineteenth Annual National Agricultural Education Research Meeting. St. Louis: American Association for Agricultural Education.

Miller, L. E. & Smith, K. L. (1983). Handling nonresponse issues. Journal of Extension, 21(5), 45-50.

National Research Council. (1988). Understanding agriculture: New directions for education. Washington, DC: National Academy Press.

Newman, M. E. & Johnson, D. M. (1992). Perceptions of Mississippi secondary agriculture teachers concerning pilot agriscience courses. Proceedings of the Nineteenth Annual National Agricultural Education Research Meeting. St. Louis: American Association for Agricultural Education.

Tyler, R. W. (1971). Basic principles of curriculum and instruction. Chicago, IL: University of Chicago Press.

Waters, R. G. & Haskell, L. J. (1989). Identifying staff development needs of cooperative extension faculty using a modified Borich needs assessment model. The Journal of Agricultural Education, 30(2), 26-32.

INSERVICE EDUCATION NEEDS OF TEACHERS OF PILOT AGRISCIENCE COURSES IN MISSISSIPPI

A Critique

Alfred J. Mannebach, The University of Connecticut--Discussant

Contributions and Significance of the Research

The researchers have conducted a valuable study. It has the potential to directly affect the content and quality of instruction in the Mississippi agricultural education program. Using the Borich discrepancy model, areas of inservice need and new units of instruction for which teachers perceive that additional materials are needed were identified. The researchers have also identified traditional areas of instruction in which teachers feel quite competent as well as important emerging units of instruction in which teachers feel they need to develop more competence.

Procedural Considerations

A sound rationale was presented for conducting the study and it was based on a relevant theoretical model. The design of the study, a descriptive survey, was identified. Research procedures were presented clearly. The researchers state that the instrument was reviewed by a panel of experts consisting of agricultural education faculty and graduate students to establish content validity. A more appropriate procedure might have been to involve representatives of the target population, namely agriculture teachers, in the validation process. Instruments should be validated for the population to be tested.

Comments and Questions

1. Is there a shift of emphasis that should occur in the undergraduate teacher preparation curriculum? Results of the study seemed to indicate that more emphasis is needed in the areas of biotechnology, computers, mechanical/physical technology, aquaculture, entomology, and plant and environmental science. Are such courses presently offered? If not, what is the role of agricultural educators to help get them initiated?

2. Is there a dearth of instructional materials in the areas identified above? If instruction in agricultural education is to be current and meet the needs of students and the labor market, instructional resources and materials must be readily available.

3. The process of establishing a research base concurrent with the development and pilot testing of a new agriscience curriculum is to be commended. Results of the study have provided the rationale for developing a proposal for the development of appropriate instructional materials. Others in agricultural education would do well to establish a research base for curriculum development and other professional activities proposed.

COMPARING LEVELS OF COMPETENCE OF OCCUPATIONAL EDUCATORS IN THEIR ABILITY TO CARRY OUT PROFESSIONAL TEACHING COMPETENCIES

Vernon D. Luft, Professor
Occupational Teacher Education
Department of Curriculum and Instruction
University of Nevada, Reno

Introduction

Preparing teachers with a high level of professional and subject matter competence is a major concern of occupational teacher educators. Another concern is that of providing relevant continuing education or inservice opportunities for teachers to maintain or increase their level of competence and improve their teaching. Experience shows that continuing education for teachers contributes a great deal to the achievement of quality teaching (Bing & Zhiling, 1991).

Determining content or topics of inservice programs can be a difficult problem for teacher educators. Barrick and Powell (1986) indicated that one purpose of conducting a needs assessment is to build a foundation for providing inservice education. The strength of an inservice workshop and the follow-up evaluation depends upon planning, and planning depends upon needs assessment. The collection of information is fundamental in meeting the participants' needs and developing effective workshops.

Doerfert and Barrick (1989) described work in Ohio whereby teacher educators and state vocational education consultants met to determine the competencies which should be taught in preservice and inservice programs for vocational teachers who entered teaching without a degree in some area of vocational education. They further stated that the final list of 25 competencies closely reflected the competencies required for vocational teacher education students in the regular undergraduate program.

Peterson (1983), in his defense of competency based teacher education, indicated that the movement generated a massive list of teacher behaviors which provided a basis for program development or at least a standard by which an institution could measure the relevance of its course based approach. Students in teacher education programs could clearly see what was expected of them. He also noted that the movement has the potential for providing a research benchmark.

A competency based vocational education project in North Dakota produced a validated task list for a vocational-technical education teacher (North Dakota State Board for Vocational Education, 1989). The validated list consisted of 120 tasks categorized by general duties of a vocational-technical teacher. The tasks are competencies which a competent vocational teacher should be able to perform well. The task list can be used by teacher educators as a basis for developing undergraduate, graduate, and continuing education courses or inservice workshops. It can also serve as a basis for assessing the competency level of program graduates or teachers in the field, as was the case in this study.

Purpose and Objectives

The purpose of this study was to assess the perceived level of competence of occupational education teachers in Nevada with regard to professional occupational education teacher competencies. Objectives of the study were to: 1) determine teaching characteristics of the responding teachers; 2) determine the perceived level of competence of occupational education teachers in their ability to perform professional teaching competencies; and 3) compare, using teaching characteristics, perceived levels of competence among occupational education teachers in their ability to perform professional teaching competencies.

Procedures

The target population for this study was occupational education teachers in Nevada. The Nevada School Districts Licensed Staff Directory (Nevada Department of Education, 1990) was used to identify the occupational education teachers in the state, which consisted of a total of 448 individuals. A sample size of one-half or 224 was drawn. This exceeded the necessary sample size recommended by Krejcie and Morgan's (1970) formula for a 5% margin of error. A systematic random sample was drawn by determining a random starting point and selecting every other occupational teacher listed in the directory.

Data for this study were collected by use of a mail survey instrument. The instrument was developed by the researcher by using the North Dakota Validated Task Listing: Vocational-Technical Education Teacher (North Dakota State Board for Vocational Education, 1989). The tasks of the validated task list were converted to items for which teachers indicated their level of competence. The first part of the questionnaire asked teachers to provide information about their teaching assignment. The second part of the instrument consisted of 120 competency (task) statements categorized by various functions of an occupational teacher. The teachers were asked to indicate their perceived level of competence in carrying out each of the competencies using the following scale: 4=highly competent, 3=moderately competent, 2=somewhat competent, and 1=not competent.

Prior to constructing the questionnaire, the task list was validated with a panel of Nevada occupational education teachers even though it had been validated in North Dakota. The validation process consisted of asking the panel of teachers if each task was necessary for an occupational teacher to perform. All tasks listed were considered to be necessary, and were left on the list. The panel was also used to assess the instrument for content validity. In addition, a university class consisting of both graduate and undergraduate students was used to conduct a pilot test. The questionnaire was revised based on suggestions from the pilot tests. The questionnaire along with a cover letter and return envelope was sent to teachers in the sample. Non-respondents were followed up with a second mailing three weeks later.

A total of 158 usable questionnaires were returned resulting in a 70.5 percent response rate. Early respondents were compared with late respondents on 25 randomly selected items. A t-test indicated no significant differences between early and late respondents. Therefore, the results were generalized to the non-respondents of the sample (Miller & Smith, 1983).

Analysis of Data

All data were analyzed using the Statistical Package for the Social Sciences, Personal Computer version (SPSSxPC). Descriptive statistics were used to analyze the data. The t-test was used to compare early and late respondents. Using Cronbach's Alpha, reliability coefficients for the task categories in the instrument ranged from .89 to .98.

Results

The first objective sought to determine the teaching characteristics of the responding teachers. Teaching characteristics data collected included program area, teaching level, years of teaching experience, and type of school district. Program areas of the responding teachers were 3.8% in agricultural education, 28.7% in business education, 29.9% in home economics education, 12.1% in industrial arts, 24.2% in trade and industrial education, and 1.3% in health occupations. A total of 19.1% taught at the middle school, 72.6% at the high school level, and

8.3% at both levels. A total of 9.5% of the respondents had three years of teaching or less, 15.2% had four to six years, 13.9% had seven to nine years, and 61.4% had ten years or more. The type of school district the responding teachers taught in were 58.2% urban, 35.7% rural, and 6.1% taught in both.

The second objective was to determine the perceived level of competence of occupational education teachers in their ability to perform professional teaching competencies. Table 1, a composite view of responses of all teachers, reports that occupational education teachers in Nevada felt most competent to perform the competencies in the category of preparing for instruction (X=3.66) followed by the categories of managing the instructional environment (X=3.51), evaluating instruction (X=3.43), implementing instructional strategies (X=3.39), performing guidance activities (X=3.27), and planning the vocational-technical program (X=3.22). Each of the mean scores indicate that teachers generally felt moderately to highly competent in those categories of tasks. Occupational education teachers felt less competent in performing the competencies in the categories of advising a vocational student organization (X=2.90), performing school-community relations activities (X=2.74), coordinating cooperative education activities (X=2.49), and utilizing curriculum assistance (X=2.48). These mean scores represent perceived competence levels from somewhat to moderately competent.

Table 1

Competency Levels of Occupational Teachers11Composite Summary

Category	Mean*	S.D.
Preparing for Instruction	3.66	.66
Managing the Instructional Environment	3.51	.70
Evaluating Instruction	3.43	.72
Implementing Instructional Strategies	3.39	.78
Performing Guidance Activities	3.27	.78
Planning the Vocational - Technical Program	3.22	.79
Advising a Vocational Student Organization	2.90	1.00
Performing School-Community Relations Activities	2.74	.88
Coordinating Cooperative Education Activities	2.49	1.02
Utilizing Curriculum Assistance	2.48	.98

*Scale: 4 = highly competent, 3 = moderately competent, 2 = somewhat competent, and 1 = not competent.

The third objective of the study was to compare perceived competency levels of occupational teachers by using teaching characteristics as the basis of comparison. Table 2 reveals that agricultural education teachers had a higher level of perceived competence than other occupational teachers in the categories of performing guidance activities (X=3.48), planning the vocational-technical program (X=3.55), advising a vocational student organization (X=4.00), performing school-community relations activities (X=3.36), coordinating cooperative education activities (X=2.74), and utilizing curriculum assistance (X=2.77). Industrial arts teachers perceived their level of competence higher than did other teachers in the categories of preparing for instruction (X=3.81), managing the instructional environment (X=3.74), and evaluating instruction (X=3.64). Home economics teachers perceived their competency level higher than other occupational teachers in the category of implementing instructional strategies (X=3.51). The perceived level of competence of business education teachers was lower than other occupational teachers in six categories, while home economics and industrial arts teachers were each lowest in two categories.

Table 2
Comparison of Competency Levels of Occupational Teachers Categorized By Instructional Program Area

Category	AG n=6	BE n=45	HE n=47 Mean* S.D.	IA n=19	TI n=38
Preparing for Instruction	3.78	3.45	3.76	3.81	3.70
	.45	.82	.60	.39	.60
Managing the Instructional Environment	3.47	3.22	3.51	3.74	3.53
	.57	.78	.68	.53	.64
Evaluating Instruction	3.58	3.25	3.53	3.64	3.36
	.58	.85	.65	.51	.69
Implementing Instructional Strategies	3.47	3.22	3.51	3.49	3.40
	.60	.87	.72	.66	.74
Performing Guidance Activities	3.48	3.22	3.32	3.36	3.21
	.52	.86	.77	.73	.74
Planning the Vocational-Technical Program	3.55	3.06	3.21	3.43	3.29
	.48	.85	.80	.62	.75
Advising a Vocational Student Organization	4.00	2.84	2.66	2.98	3.00
	.00	1.03	1.10	1.03	.81
Performing School-Community Relations Activities	3.36	2.59	2.79	2.99	2.62
	.57	.94	.88	.88	.79
Coordinating Cooperative Education Activities	2.74	2.48	2.39	2.49	2.54
	.59	1.09	1.06	1.09	.93
Utilizing Curriculum Assistance	2.77	2.37	2.66	2.57	2.35
	.98	.93	1.01	.92	.96

*Scale: 4 = highly competent, 3 = moderately competent, 2 = somewhat competent, and 1 = not competent.

Table 3 summarizes occupational teachers' perceived levels of competence categorized by their years of teaching experience. Teachers with one through three years of experience had highest perceived levels of competence in the categories of advising a vocational student organization (X=3.03), performing school-community relations activities (X=2.84), and coordinating cooperative education activities (X=2.82). Teachers with four through six years of experience had highest competence levels in the categories of managing the instructional environment (X=3.59), implementing instructional strategies (X=3.43), and performing guidance activities (X=3.42). Occupational teachers with seven through nine years of experience had highest competence levels in the categories of preparing for instruction (X=3.75) and evaluating instruction (X=3.45), while those with ten years or more had highest perceived competence levels in planning the vocational-technical program (X=3.25) and utilizing curriculum assistance (X=2.54). Teachers in the seven through nine years of teaching range had the lowest perceived level of competence in five categories while those in the one through three year range had lowest levels in three categories.

A comparison of perceived competency levels between occupational education teachers teaching in rural and urban settings is shown in Table 4. It is interesting to note that urban occupational education teachers perceived their level of competence higher than did their rural colleagues in all ten of the categories.

Table 3

Comparison of Competency Levels of Occupational Teachers Categorized By Years of Teaching Experience

Category	1-3 n=15	4-6 n=24	7-9 n=22	10 or more n=97
	Mean* S.D.			
Preparing for Instruction	3.64 .62	3.71 .46	3.75 .44	3.63 .46
Managing the Instructional Environment	3.42 .64	3.59 .70	3.47 .61	3.51 .74
Evaluating Instruction	3.41 .64	3.43 .62	3.45 .58	3.43 .78
Implementing Instructional Strategies	3.42 .66	3.43 .67	3.33 .72	3.40 .82
Performing Guidance Activities	3.29 .74	3.42 .73	3.20 .70	3.25 .82
Planning the Vocational-Technical Program	3.16 .71	3.19 .69	2.18 .79	3.25 .83
Advising a Vocational Student Organization	3.03 .78	2.95 1.05	2.98 .89	2.85 1.05
Performing School-Community Relations Activities	2.84 .98	2.80 .87	2.64 .84	2.72 .89
Coordinating Cooperative Education Activities	2.82 .81	2.58 1.03	2.28 .91	2.46 1.06
Utilizing Curriculum Assistance	2.32 1.04	2.37 .93	2.46 .94	2.54 .99

*Scale: 4 = highly competent, 3 = moderately competent, 2 = somewhat competent, and 1 = not competent.

Table 4

Comparison of Competency Levels of Occupational Teachers Categorized By Rural or Urban Teaching Setting

	Rural n=56		Urban n=93	
Category	Mean*	S.D.	Mean*	S.D.
Preparing for Instruction	3.59	.68	3.70	.65
Managing the Instructional Environment	3.48	.67	3.52	.71
Evaluating Instruction	3.35	.72	3.47	.72
Implementing Instructional Strategies	3.31	.76	3.44	.78
Performing Guidance Activities	3.22	.73	3.29	.82
Planning the Vocational - Technical Program	3.15	.79	3.27	.79
Advising a Vocational Student Organization	2.90	1.03	2.94	.97
Performing School-Community Relations Activities	2.66	.87	2.78	.90
Coordinating Cooperative Education Activities	2.34	.95	2.62	1.03
Utilizing Curriculum Assistance	2.34	.98	2.56	.97

*Scale: 4 = highly competent, 3 = moderately competent, 2 = somewhat competent, and 1 = not competent.

Conclusions and Recommendations

The findings indicated that the largest groups of occupational education teachers responding were teaching in the program areas of business education, home economics, and trade and industrial education. A majority of the teachers were teaching in an urban high school and had ten years or more of teaching experience.

Nevada occupational education teachers felt at least somewhat competent in all areas studied. Agricultural education teachers had a higher perceived level of competence than did other occupational education teachers in six of ten categories, while business education perceived their competence to be lower than did other teachers in six categories. Years of teaching experience did not appear to make a difference on the teachers' perceived level of competence, except those in the seven through nine year range had the lowest mean score in five categories. Urban teachers had a higher perceived level of competence than rural teachers.

It is recommended that the results of this study be used to guide the undergraduate occupational education teacher education program in Nevada. While all categories and tasks should be addressed in the program, it becomes more important that those which occupational teachers indicated a lower level of perceived competence be given more attention.

The results of this study should also be considered when planning teacher inservice education for occupational teachers. Inservice education is most needed by Nevada occupational education teachers in cooperative occupational education programs and advising vocational student organizations. Some areas in which "weak" competency levels were reported might best be included within content of other courses. Inservice or continuing education opportunities should be provided to address the categories in which perceived competency levels were lowest.

The results of this study point out how the teachers measure up with their colleagues in other occupational education disciplines with regard to their perceived level of competence in carrying out professional competencies. It is evident that the agricultural education teachers in the sample "measured up" quite well.

References

Barrick, R. K. & Powell, R. L. (1986). Assessing needs and planning inservice education for first-year vocational agriculture teachers. Proceedings of the Thirteenth Annual National Agricultural Education Research Meeting, 42-47.

Bing, L. & Zhiling, Y. (1991). Teacher education innovations in the Asia-Pacific region. Action in Teacher Education, 13(3), 1-6.

Doerfert, D. L. & Barrick, R. K. (1989). Teacher and supervisor perceptions of vocational agriculture teacher abilities. Proceedings of the Central States 43rd Annual Research Conference in Agricultural Education.

Krejcie, R. V. & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30, 607-610.

Miller, L. E. & Smith, K. L. (1983). Handling nonresponse issues. Journal of Extension, 21(5), 45-50.

Nevada Department of Education. (1990). Nevada School Districts Licensed Staff Directory. Carson City, NV: Author.

North Dakota State Board for Vocational Education. (1989). North Dakota Validated Task Listing: Vocational-Technical Education Teacher. Competency Based Vocational Education Project. Bismarck, ND: Author.

Peterson, R.L. (1983). Competency based teacher education reasons for its use. The Journal of the American Association of Teacher Educators in Agriculture, 24(3), 2, 7-13.

COMPARING LEVELS OF COMPETENCE OF OCCUPATIONAL EDUCATORS IN THEIR ABILITY TO CARRY OUT PROFESSIONAL TEACHING COMPETENCIES

A Critique

Alfred J. Mannebach, The University of Connecticut--Discussant

Contributions and significance of the Research

It is important to inventory the competencies of our teachers periodically. Studying the perceived competencies of agriculture teachers to see how they compare with the perceived competencies of teachers in other vocational service areas can be enlightening to the profession. Mayo and DuBois (1987) described four levels at which training outcomes can be evaluated. Level I measures the trainees' reactions and acceptance of the material. Level II measures the trainees' learning of knowledge and skills. Level III measures changes in behavior and on-the-job performance. Level IV measures organizational results and improved operational performance. The four levels correspond with four basic evaluation criteria: (a) did the trainees enjoy the training?; (b) did the trainees learn anything?; (c) did the training help on-the-job performance?; and (d) did the training help organizational performance? One shortcoming of the study was that data were collected about the perceptions of the teachers; not the actual results of past education and experience on job performance.

Procedural Considerations

The research procedures reported seem to be appropriate. A question might be raised regarding why a systematic random sample drawn by determining a random starting point and selecting every other occupational teacher listed in the directory was used instead of a random sample. A random sample would have allowed every occupational education teacher in the state a chance to be involved in the study The author is to be commended on re-validating and pilot testing the instrument prior to use.

Comments and Questions

1. Why were undergraduate students used in the pilot test? Instruments should be validated for the population intended.

2. Perhaps the word "perceived" should be inserted before competency levels in the table titles to reflect more accurately the issues studied.

3. A breakdown of number of teachers by gender in each of the program areas would be beneficial. Such a breakdown would serve two purposes: (1) It would provide an indication of the extent to which gender equity is evident in occupational education teachers in Nevada and (2) it may explain why agriculture teachers (presumed to be primarily male) perceived themselves to be more competent in six of the ten categories, while business teachers (presumed to be primarily female) perceived themselves to be lowest in six of ten categories.

Mayo, G.D., & DuBois, P.H. (1987). The complete bood of training: Theory, principles, and techniques. San Diego, AC: University Associates.

A NATIONAL STUDY OF STUDENT TEACHING REQUIREMENTS IN AGRICULTURAL EDUCATION

Jacquelyn P. Deeds
Associate Professor
Department of Agricultural Education and Experimental Statistics
Mississippi State University

Introduction

Experience-based learning to bridge the gap between work or actual practice and study has long been a goal in the preparation of professionals in all fields (Byrne & Wolfe, 1976). The history of field experiences in education started with the advent of academic preparation for education in normal schools in the 1830's and has continued to change and develop as teacher education programs have evolved to their present state (Sinclair, 1975). The culminating field experience of student teaching, in some form, is the one element that is common to teacher education programs.

Field experiences are mandated in National Council for Accreditation of Teacher Education standards by which teacher education programs are accredited. Standard II.A: Clinical and Field-Based Experiences says, "The unit makes certain that clinical and field-based experiences in the professional education curriculum are designed to prepare students to work effectively in specific education roles" (NCATE, 1990, p. 49). NCATE also mandates that the student teaching experience be a full-day for at least 10 weeks. How these experiences are structured and how they are conducted are the prerogative of each institution. According to Burstein (1988) "To maximize the student teaching experience, universities need to determine what activities are important in preparing a student teacher, providing opportunities for such activities and monitor the activities to ensure quality student teacher training" (p. 16).

A recent national study by Larke, Norris and Briers (1992) examined the perceptions of teacher educators, cooperating teachers and student teachers concerning the student teaching experience in agricultural education. They asked these three groups their perceptions of how the experience should be structured, what should be the ideal roles of the parties involved and what requirements should be met by cooperating teachers and schools.

The teacher educators perception of how long the student teaching experience should be as reported by Larke et al. (1992) was 10.6 weeks. The study indicated that teacher educators "strongly agreed" (4.63 on a 5-point scale) that "Student teaching centers should allow faculty members to make final student teacher placement decisions." The study also reported that teacher educators were "neutral" (3.17) on allowing "student teachers to select teaching center." The perception study indicated that teacher educators "agreed" (3.76) that student teachers should be required to live in the community.

The Larke et al. (1992) study indicated that teacher educators "agreed" (4.14 on a 5-point scale) that cooperating teachers should have a masters degree. The study indicated the perceived ideal length of teaching experience prior to serving as a cooperating teacher was 4.86 years and 3.6 years teaching in their current school. Teacher educators "strongly agreed" that cooperating teachers should "be required to attend a special course or workshop" and that they should "display continual professional growth" (means of 4.51 and 4.62 respectively). The study also indicated that teacher educators "agreed," mean = 3.79, that cooperating schools should "have and active adult/young farmer program.

The study presented teacher educators perceptions of the ideal, but how is that reflected in actual practice? What do departments actually require student teachers to do? What is the duration of the experience? What requirements are cooperating teachers actually required to meet?

No recent studies reflect current practice in the agricultural education profession. Deeds, Arrington and Flowers (1988), as a result of their study of cooperating teacher attitudes about student teaching in three states, recommend further study to determine if expectations concerning student teaching were changing as a result of educational reform programs nationwide. The report of the AAAE Ad Hoc Work Group on Developing Curriculum Options in Agricultural Education noted that the role of agricultural education departments has changed in the last 10 years including a broadening of the role with less emphasis on teacher education (Herring, 1992). Have those changes affected the student teaching experience?

Purpose and Objectives

The purpose of this study was to determine the scope and nature of field experiences required of students in pre-service teacher education programs. The specific objectives for the study were as follows:

1. To determine the scope of the student teaching experiences.

2. To determine what assignments or activities were required for a grade during student teaching.

3. To determine the nature of the student teaching placements including site selection and credit earned.

4. To determine the type and scope of supervision during the student teaching experiences.

Procedures

Data for the study were collected using a researcher developed instrument in the Fall of 1992. Content validity of the instrument was determined by a panel of experts made up of agricultural education faculty and graduate students. The frame for the study was all 97 institutions listed in the AAAE Directory for 1992. The instruments were mailed with a cover letter and stamped return envelope to department heads of agricultural education departments listed in the directory. Non-respondents were sent a follow up postcard after the September 18 return date. A second mailing of the instrument was completed in early October. All non-respondents were contacted by phone and asked to complete the instrument. Five institutions indicated that they no longer had agricultural teacher education programs at their institution, making the final population 92 institutions.

The total response rate was 89 percent with 82 of the 92 institutions responding. The instrument consisted of 39 forced choice questions concerning field experience requirements and expectations, as well as demographic information concerning the institutions. The nature of the instrument made the determination of a reliability coefficient inappropriate. Data were analyzed using SPSSpc.

Findings

The responding institutions represented all of the AAAE regions. Southern region had the most respondents with 36 (43.4%) followed by central with 19 (22.9%), and western and eastern regions each with 14 (16.9%) responding institutions. A majority of the respondents (58 or 69.9%) indicated they were located in a college of agriculture. The next most common location was the college of education with 15 (18.1%) followed by joint appointments in five (6.0%) institutions and five reporting their location as other than those listed.

The responding institutions indicated an average of 2.4 faculty supervising field experiences with a range of 1 to 10. A majority of the institutions had 1 or 2 faculty members supervising. (Table 1).

Table 1
Number of Faculty Members Involved in Field Experience Supervision

Number of Faculty Members	Frequency	Percentage
1 - 2	51	61.4
3 - 4	23	27.8
5 - 6	7	8.4
7 - 8	1	1.2
9 - 10	1	1.2
Total	83	100.0

Graduate students were not used to supervise field experiences in 68 (82.9%) of the responding institutions. Six (7.3%) institutions used one graduate student supervisor, four (4.9%) used two, three (3.7%) used three and one institution used four.

Over 75% of the responding institutions had less than 50 teaching agricultural education majors in their department. The number of students enrolled in a teaching agricultural education degree ranged from 1 to 145 students. The mean number was 36.5. Table 2 indicates that two schools reported 100 or more students in the teaching degree option.

Table 2
Number of Teaching Option Agricultural Education Majors

Number of Majors	Institutions	Percentage
1 - 25	33	40.7
26 - 50	31	38.3
51 - 75	10	12.4
76 - 10	5	6.2
101 - 125	1	1.2
126 - 150	1	1.2
Total	30	100.0

The duration of student teaching has a bimodal distribution with 10 weeks, reported by 27 institutions, and 12 weeks reported by 22, being the most common. The range was 7 to 18 weeks with a mean of 11.9 weeks required. Credit awarded on a semester credit basis varied from 5 to 15 with a mean of 9.7. The number of weeks of student teaching had increased in the last ten years in 43 (52.4%) of the responding institutions with 4 (4.9%) indicating a decrease. The number of weeks required is specified by state certification requirements at 38 (46.3%) institutions, by the ag ed faculty at 14 (17.1%) and by the College of Education at 19 (23.2%) institutions. Eleven institutions used a different method or a combination of those above.

The most common means of assignment to student teaching sites was by student selection from an approved list, 37 (44.6%) institutions, followed closely by faculty assignment at 32 (38.6%) institutions, with students free to select the site in 2 (2.4%) institutions. A combination of the above methods was used in 12 (14.5%) of the institutions. The Students were not allowed to return to their home high school to student teach in 76 of the 83 institutions. Some respondents indicated it was occasionally allowed with an older student or if it was allowed it was strongly discouraged. Fourteen (16.9%) of the responding institutions required the student teachers to live in the school district where they would be student teaching. Of the 69 (83.1%) that did not require students to live in the district, the average number of miles students were allowed to commute ranged from 10 to 60 with a mean of 35 miles.

Table 3 indicates the most reported assignments or activities required for a grade in student teaching. Five assignments or activities were required by over 90% of the responding institutions including "observe agriculture teaching," "develop teaching plans," "participate in FFA activities," "participate in the preparation of FFA contest teams," and "attend agriculture teacher professional meetings." "Keep financial records (travel, supplies, etc.)" was the least often required assignment (43.4%). Other student teaching assignments mentioned several times included: participation with adult education, completing a community survey, meeting with the advisory committee, completing a bulletin board and completing SAE or special needs student profiles.

Table 3
Student Teaching Assignments/Activities Required For Grade

Assignment/Activities	Number	Percentage
Observe Agriculture Teaching	82	98.8
Develop Teaching Plans	81	97.6
Participate in FFA Activities	80	96.4
FFA Contest Preparation	75	90.4
Attend Agriculture Teacher Meetings	75	90.4
Complete SAE Supervision	74	89.2
Diary of Experiences	74	89.2
Meet with School Administrators	73	88.0
Attend School in-service	72	86.7
Participate in SAE Planning	71	85.5
Use University Specified Methods	70	84.3
FFA Public Relations	67	80.7
Participate in Community Activities	64	77.1
Completion of FFA Award Applications	63	75.9
School Activities Other Than Ag	59	71.1
Observe Teaching in Other Disciplines	58	79.9
Keep Financial Records	36	43.4

Cooperating teachers were required to meet specific requirements at 77 (92.8%) of the responding institutions. A masters degree was required by 33 (52%) institutions with a bachelors degree required by 31 (48%). A minimum of 3 years of teaching experience was required by 45

(62.5%) of the departments with a mean of 3.6 years. Teachers were required to have taught in their current school a mean of 2.5 years.

Special training for cooperating teachers in student teacher supervision was required by 51 (66.2%) of the respondents and 44 (57.1%) required that they be a member of their professional organization. In addition 10 institutions required that teachers have an adult/young farmer program and 9 required an active FFA Alumni chapter. Other cooperating teacher requirements that were mentioned several times by respondents included: active in FFA contests, have a well balanced program, be approved by the state department of education, have adequate facilities and equipment and if they don't already have a masters degree be working on one.

Cooperating teachers were required to complete written evaluation of student teachers. The range of evaluations reported was from one at the end of the experience to one every day of student teaching. The mean number of written evaluations by the cooperating teacher was 5 with a mode of 2.

University supervisors made an average of 3.7 supervisory visits per student teacher. The range in the number of visits was 2 to 9 with a mode of 3. Fifteen departments (18.3%) permitted graduate students to supervise student teachers; 11 allowed doctoral degree students to supervise and 6 permitted masters students. Several respondents indicated that graduate students were encouraged or permitted to accompany faculty on supervisory visits.

Conclusions and Recommendations

The number of weeks required for student teaching has increased in a majority of the agricultural education departments in the last 10 years. The mean number of weeks required (11.9) exceeds the perceived ideal reported (10.6) by more than a week. This may be reflective of the fact that in most states the number of weeks required is determined by state certification agencies or colleges of education in nearly 70% of the institutions reporting.

The data indicated that in most states student teaching placement in a combination of student desires and faculty control. Faculty have control in that students are allowed to select from an approved list developed by the faculty or the final placement is made by the faculty. This supports the perceived desire of the faculty to make the placement. Students are not allowed to return to their home high school to teach, however, they are also not required to live in the community where the student teaching experience is being completed which was a faculty perception of the ideal. Most departments discourage student teachers from commuting more than 35 miles to student teach.

Common student teaching assignments or activities covered all areas of a well rounded agricultural education program including planning for instruction, participation in FFA activities, supervised agricultural experience program supervision and planning, and participation in school and community activities. Keeping financial records and observing teaching in other disciplines were the least common student teaching assignments. Several respondents returned copies of their student teaching assignments with their instrument which provided additional information of interest to the researcher. One area of concern was keeping financial records. Teachers, especially new teachers, often complain about the paperwork required and not being prepared to deal with the record keeping. Departments may want to consider adding record keeping and/or forms to their requirements.

Only five of the responding departments did not require cooperating teachers and schools to meet some specific requirements. An advanced degree was preferred by a majority of the departments and a minimum of three years teaching experience. Teacher educators perceived that cooperating teachers needed special training in the Larke et al (1992) and followed up that belief by requiring special cooperating teacher training in two-thirds of the institutions. Teacher educators agreed with the perception that cooperating teachers should have adult/young farmer programs; however, only nine institutions had an adult program as a site requirement which is a major discrepancy.

Departments should consider having more specific and stringent requirements for cooperating teachers and sites. The research on field experiences indicates that student teachers often emulate the cooperating teacher. If cooperating teachers are not required to be members of their professional organization or to have adult programs, student teachers may receive the wrong message.

All departments required cooperating teachers to do written evaluations of the student teachers performance. In several departments, only one at the end of the experience was required while other departments required something written every day. The mean number of written evaluations divided into the mean number of weeks of student teaching would indicate a written evaluation about once every two weeks of the experience. The question for further research would be: what other kinds of feedback are cooperating teachers providing to the student teachers if written evaluations are not required?

Graduate students were permitted to supervise student teachers in less than one-fifth of the agricultural education departments nationwide; those that did use graduate student supervisors were more likely to use doctoral students. Comments on the instrument indicated that graduate students were encouraged to make supervisory visits with faculty members who visited students three to four times during the experience. Because most teacher educators in agriculture are involved in student teacher supervision, departments may want to consider requiring graduate students to participate in supervision. Student teachers are required to make a specified number of SAEP visits to prepare them for teaching. Perhaps, graduate students should be required to accompany faculty on a specified number of supervisory visits.

Recommendations for further study on the subject include:

1. Determine more specifically the assignments required for student teaching by collecting copies of actual student teaching assignments to determine more specifically what the assignments are, how many times students are expected to complete some activities and to what level (eg. are they to observe or actually perform a specific activity). This information would be helpful in modifying current experiences, especially in those departments that are being called on to expand, or in some cases, reduce the length of the student teaching experience.

2. Determine what types of feedback are provided to student teachers by cooperating teachers and university supervisors. Determine what type of forms, if any, are used for student teacher evaluation. This information could be useful in modifying current forms used or in developing forms to better serve students needs for feedback.

3. Although all departments responding indicated that they supervised student teachers on-site, it is not clear what activities are conducted during the supervisors on-site visits. Additional research into what is done and what activities seem to be most effective could prove helpful to new professionals in agricultural education supervising student teachers for the first time.

References

Burstein, N. D. (1988, April). From observing to teaching: An examination of relationships between student teachers' activities, perceptions and performance. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.

Byrne, E. T. & Wolfe, D. E. (1976). Experience-based learning in business education. In Warner, A.E. and others (Eds.), Clinical experiences and clinical practice in professional education. Washington, DC: Fund for Improvement of Post-Secondary Education.

Deeds, J. P., Arrington, L. R. & Flowers, J. L. (1988, April). Cooperating teacher attitudes regarding cooperating teachers and student teaching experience expectations in vocational agriculture in three states. Paper presented at the Southern Region Research Conference in Agricultural Education, Orlando, FL.

Herring, D. R. (1992). Developing curriculum options in agricultural education. (Monograph of the American Association for Agricultural Education). Presented at the meeting of the American Vocational Association, December 5, 1992, St. Louis, Missouri.

Larke, A, Jr., Norris, R. J., & Briers, G. E. (1992, April). A three-year national study of teacher educator, supervising teacher, and student teacher perceptions concerning the selection of student teaching centers and supervising (cooperating) teachers in agriculture. Paper presented at the Southern Region Research Conference in Agricultural Education, New Orleans, LA.

National Council for Accreditation of Teacher Education. (1990). Standards, procedures, and policies for the accreditation of professional education units. Washington, DC: NCATE.

Sinclair, W. (1975). Field-based teacher education and K-12 personnel responsibilities in teacher education: a review. Washington, DC: American Association of Colleges for Teacher Education. (ERIC Document Reproduction Service No. Ed 102-097).

A NATIONAL STUDY OF STUDENT TEACHING REQUIREMENTS IN AGRICULTURAL EDUCATION

A Critique

Alfred J. Mannebach, The University of Connecticut--Discussant

Contributions and Significance of the Research

Keeping abreast of continuing change in teacher education is an important activity of the agricultural education profession. The researcher has conducted a relevant and useful study by comparing results of what was perceived in 1992 to be the ideal student teaching experience with results of a nationwide survey of the scope and nature of field experiences of students enrolled in pre-service teacher education programs as reported by head teacher educators. Key findings indicate that current student teaching formats and practices approach the perceived ideal program. The major exceptions found were that of students not being placed with cooperation teachers who have adult education programs; student teachers not being required to keep financial records and complete various reports; and student teachers not observing teaching in other disciplines.

Procedural Considerations

The researcher reported the use of appropriate research procedures for this study. Descriptive survey research procedures were used and a high response rate, 89 percent, was obtained. Demographic data, as well as factual data regarding the status of student teaching practices used within the agricultural education programs studied, were collected.

Comments and Questions

1. An important issue to be resolved is whether or not student teachers should be placed with cooperating teachers who are teaching adult education. Results of the study indicated that nine of the 82 institutions surveyed had the requirement that student teaching centers have an adult education program. Our philosophy seems to be that adult education is an integral part of the agricultural education program. Practice would indicate otherwise. Either our philosophy should be changed to reflect our practice or our practice should be changed to reflect our philosophy.

2. To what extent is it reasonable for student teachers to spend time on financial reports and records during the student teaching period? Such reports and records may be considered to be sensitive, complicated, or confidential. The university supervisor should discuss the matter with the cooperating teacher to resolve the issue.

PERCEPTIONS OF CRITICAL COMPETENCIES FOR THE SURVIVAL OF BEGINNING AGRICULTURE AND HOME ECONOMICS TEACHERS FROM FOUR EDUCATIONAL PERSPECTIVES

Laurie Stenberg Nichols
Assistant Professor
School of Family and Consumer Sciences
University of Idaho

John Mundt
Associate Professor
Agricultural and Extension Education
University of Idaho

Introduction

Alarming research in the 1980s found that today's beginning teachers are less confident, qualified or competent than teachers who graduated in earlier years (Gardner, 1983; Griffin, 1983). In addition, the current retention rate of beginning teachers is only 50%--nearly one-half of all teachers will drop out by their sixth year of teaching (Jensen, 1986; Curtis, 1985). Concepts such as mentoring, induction and peer coaching have similar goals--to help beginning teachers feel less isolated and provide encouragement, support and pedagogical assistance. The goal is to help teachers be successful and stay in the profession. The intent is honorable and appears to have significance and worth. Yet a basic, underlying question remains unanswered...what are realistic expectations of beginning, novice secondary teachers? Are we being realistic when we expect emerging individuals with little experience to be successful in all facets of teaching?

Fuller (1969) pioneered work in understanding the concerns and needs of beginning teachers. She found that beginning teachers, first and foremost, had concerns about self. Their immediate concern was primarily based on their own need to experience personal success in the classroom. Other researchers have identified needs of beginning teachers to include classroom management and control, dealing with parents and administrators, managing time, organizing activities, motivational ideas, and general instructional planning (Block & Griggs, 1988; Loughlin & Farraro, 1987; Varah, 1985). Further research has shown that by the second or third year of teaching, attention had shifted from concern for self, to concern for tasks (e.g. more efficient ways of performing a teaching task). By the third year of teaching, problems encountered by teachers include activities outside of teaching, lack of supplies and equipment, lack of communication with administration and teaching low ability students (Heath, Camp & Barber, 1988).

Vocational educators have taken a strong interest in beginning assistance programs for vocational teachers. Heath-Camp and Camp (1992) stated that "no period is more critical to the success of a beginning teacher than the induction phase." In their national study of beginning vocational teachers, they found that some induction activities are occurring, but there are many forms of assistance the beginning vocational teachers think they need but are not receiving. For example, provision of a curriculum guide for organizing a course was not being provided to nearly 25% of the beginning teachers. Perhaps an even more alarming finding from the Camp study was that one-fourth of these teachers were never observed or visited by the principal during their entire first year of teaching. A strong recommendation has resulted from this research to leaders in vocational education and school administrators that both groups should be more sensitive and responsive to the needs and realities of the first year vocational teacher.

Heath, Camp and Barber (1988) suggested that beginning teachers were not prepared for the mass responsibility and expectations of a teacher in vocational subject areas. They recommended "both teacher education programs and local school systems need to provide realistic expectations for beginning teachers. School systems need to analyze these expectations and determine what is realistic for persons who are relatively inexperienced in their fields" (p. 62). According to Howey and Zimpher (1989) it should be the first responsibility of higher education to identify the major issues and expectations of beginning teachers and attempt to prepare beginning teachers to effectively deal with the issues and expectations. Heath-Camp & Camp (1992) emphasized that beginning teachers should not be asked or expected to design courses, organize and sequence curriculum, find instructional materials or provide the instruction without assistance. Heath, Camp and Barber (1988) suggested that beginning teachers were assigned too many responsibilities in addition to the expectations of teaching. The additional responsibility of sponsoring school clubs, classes and possibly coaching requires much of the time beginning teachers need to prepare for day-to-day teaching duties. Howey and Zimpher (1989) recommended beginning teachers should be given a break. The authors further suggested beginning teachers should have a reduced workload, release time, peer discussions and mentors available in order to more adequately prepare instructional materials as well as prepare mentally.

Resulting from this knowledge has been a growing realization that vocational leaders in state departments of vocational education and teacher educators as well as local school administrators are not "in sink" with the real world...they do not know what is critical for the survival of the beginning teacher. Even many mentoring programs designed to address the needs of beginning teachers are failing to meet the goal of teacher assistance (Camp & Heath-Camp, 1991). To induct, socialize and acculturate these novice individuals into the vocational teaching profession, the various constituencies need to analyze their expectations and determine what is realistic for vocational teachers who are inexperienced in their fields.

Purpose and Objectives

The purpose of this study was to compare perceived critical competencies of first year agriculture and home economics teachers from the perspectives of vocational education leaders (state supervisors and teacher educators), secondary administrators (building principals) and the beginning vocational teacher. Three null hypotheses were tested including:

Ho 1: There are no significant differences between eight groups of educators (agriculture state supervisors, teacher educators, beginning teachers and their building principals; home economics state supervisors, teacher educators, beginning teachers and their building principals) on those teacher responsibilities deemed most critical for the survival of a beginning teacher.

Ho 2: There are no significant differences on perceived critical competencies for beginning teachers based upon field of study (home economics or agriculture).

Ho 3: There are no significant differences on perceived critical competencies for a beginning teachers based upon position (state supervisor, teacher educator, principal, beginning teacher).

Procedures

The target populations to be sampled included all state supervisors and teacher educators of agriculture and home economics, first year agriculture and home economics teachers from 10 western states, and secondary principals of these beginning teachers. The researchers limited beginning teachers to 10 western states due to the complexity of obtaining names of beginning teachers. A population of state supervisors (n=50) and teacher educators (n=91) in agriculture were surveyed. A population of state supervisors (n=50) and a random sample of teacher educators (n=98) in home economics were surveyed. A random sample of teacher educators in home economics was used as the population was nearly four times that of agriculture teacher educators. A population of beginning teachers in agriculture and home economics who taught in 10 western states were surveyed. In addition, their building principals were also surveyed. The return rates varied from a high of 87% for agriculture teacher educators to a low of 59% for principals of beginning home economics teachers. The overall return rate was 72%. Early and late respondents were compared on means for each of the twelve competency scales and no significant differences resulted.

A researcher developed questionnaire was used to gather data. The survey asked subjects to respond to 70 specific competencies grouped into twelve broad areas: program planning and development; administration and management; facility management, safety and health; community outreach; instruction; individual student uniqueness and difference; maintaining classroom control; teacher socialization; professional development; vocational student organizations; extended summer contract; and supervised occupational experience. For each competency/task, subjects respond on a Likert-type scale from 5 (absolutely essential) to 1 (not at all essential). Content validity was established through the use of an expert panel of educators. Each were given the broad educational areas and asked to place the appropriate list of competencies under appropriate areas. Based upon responses, minor modifications were made. The questionnaire was then pilot tested to groups of educators: teacher educators, state assistant supervisors, beginning teachers and principals. A total of twelve pilot subjects were used: three from each sample group. Once again, minor modifications were made based upon pilot results. Dillman's procedures were followed and two complete mailings plus follow-up telephone reminders were conducted. Questionnaires were mailed in two phases: Fall of 1991 to state supervisors and teacher educators and April of 1992 to teachers and principals. The hope was to gain their input at the conclusion of their first year.

Analysis of Data

Data were analyzed using frequencies and measure of central tendency. To test hypothesis one, twelve separate Kruskal-Wallis one way analyses of variance of ranks were performed for each critical competency. Hypothesis two and three were analyzed using multiple analysis of variance with Tukey's comparison tests to test differences among the various groups on twelve critical educational competencies.

Results

To test the first hypothesis, respondents were asked to identify the three most critical teacher responsibilities for the survival of the first year teacher by ranking their first, second and third choice. Twelve broad areas were listed and in addition, respondents could write in any additional. Separate Kruskal-Wallis 1-way ANOVAs were computed on each responsibility (dependent variable) using the eight groups. The null hypotheses were rejected for seven of the 12 critical responsibilities. Groups differed significantly on facilities safety and management, individual student uniqueness, vocational student organization, program planning and development, teacher socialization, supervised agriculture experience, and instruction (see Table 1). Groups did not differ on administration and management, community outreach, extended summer program, maintaining classroom control, and professional development and leadership.

The second hypothesis was to assess the degree to which field (agriculture/home economics) differed on perceived critical teacher competencies. First, standardized scale scores were computed on each broad competency area. Reliabilities were computed and ranged from .68 to .97. Next, MANOVA was computed using field of study as the criterion variable and the 12 scales scores as the dependent variables. The null hypothesis was rejected as the multivariate analysis of variance was significant ($F=13.21$, $p<.001$). Univariate F-tests indicated that three scales were significantly different at the .05 level. They were student organizations ($F=59.04$, $p < .001$), student uniqueness ($F = 37.25$, $p < .001$), and community outreach ($F=7.54$, $p < .05$). Tukey's multiple comparison test were computed on each scale. For the first scale, student organizations, agriculture principals, teacher educators and teachers believed a vocational student organization to be significantly more critical to the survival of a beginning teacher than did all home economics professionals. For the second scale, student uniqueness, home economics principals, state supervisors and teacher educators believed this competency to be more critical to the survival

Table 1
Kruskal-Wallis *H* Values Between Eight Groups on Twelve Critical Survival Competencies for Beginning Teachers of Agriculture and Home Economics

Competency	Facilities Safety/ Management	Individual Student Uniqueness	Vocational Student Organization	Program Planning & Development
H between groups	25.76[a]	44.04[a]	49.69[a]	43.73[a]
	Teacher Socialization	Supervised Agriculture Experience	Instruction	Administration & Management
H between groups	15.22[b]	18.32[b]	20.60[b]	8.61
	Community Outreach	Extended Summer Program	Maintaining Classroom Control	Professional Development
H between groups	9.32	10.74	6.56	11.90

[a] value required for significance at the .001 level, df = 7, is 22.24.
[b] value required for significance at the .05 level, df = 7, is 13.82.

of a beginning teacher than did agriculture teacher educators, teachers, or state supervisors. The final scale, community outreach was believed by agriculture teacher educators to be significantly more critical to a beginning teacher than did home economics state supervisors.

The third hypothesis was to explore the degree to which position influenced perceptions of critical competencies for beginning teachers. A MANOVA was computed and found to be significant at the .001 level (F= 5.362). Univariate F-Tests indicated that six of the scales were significant at the .05 level including program planning (F=4.70, p < .05), student vocational organizations (F= 6.37, p<.001), professional development and leadership (F=3.08, p<.05), student uniqueness (F=4.10, p<.05), socialization (F=4.23, p<.05), and classroom control (F=3.47, p<.05). Tukey's multiple comparison were computed for each significant scale. Results indicated that for program planning, home economics teacher educators believed this competency to be more critical to the survival of a beginning teacher than did home economics teachers or their principals. Vocational student organizations was rated more critical by agriculture teacher educators and teachers than by home economics principals, state supervisors, principals, or teacher educators. Professional development and leadership was perceived to be more critical to agriculture teacher educators than principals of agriculture teachers. Student uniqueness was rated more critical to home economics principals, supervisors and teacher educators than agriculture teacher educators, teachers, state supervisors and principals. The final two scales, socialization and classroom management found no significance between groups when compared in a one-way analysis format.

Conclusions and Recommendations

Findings indicate that groups appear to differ on the rank order of critical responsibilities for beginning teachers. All groups ranked classroom control as the number one critical responsibility of a beginning teacher for his/her survival. Facilities management/safety, instruction and student uniqueness were ranked high as critical responsibilities, but groups were not in agreement as to the order of importance of these. Program planning, teacher socialization, vocational student organizations and SAE were less likely to be rated as a top critical responsibility of a beginning teacher, however groups differed according to the relative importance they assigned to these areas. These findings appear to somewhat fit with Fuller's notion of concern for self. Classroom control, safety, instruction and student uniqueness are all responsibilities which address the potential for personal success as a teacher---both in their own eyes and the eyes of others (e.g. students, administrators, etc.). The responsibilities which were rated as somewhat less critical are those which may focus on concern for tasks or for the overall success of the program. Areas such as program planning, vocational student organization and SAE could be considered enrichment areas or areas to be developed in the second year of teaching. It appears that educators are approaching agreement as to critical first year responsibilities. However, educators must continue to come to agreement as to what is critical for a first year teacher to know and demonstrate, and those responsibilities which can be picked up the second or third year of teaching. This study suggests that there is still some discrepancy between the various groups as to what is critical. Therefore, one can assume that beginning teachers are receiving mixed and sometimes conflicting information and advice from the various groups of educators.

Field or discipline appears to be different in perceptions of critical competencies in only three of the 12 areas: student uniqueness, student organizations and community outreach. In the case of student uniqueness, home economics educators rated this as more critical than agriculture educators. For the other two scales, student organizations and community outreach the opposite was true, agriculture educators perceived these to be more critical than did home economics professionals. Thus, it appears that vocational educators do not differ greatly based upon their discipline. However, when they do, the differences appear to be with agriculture which advocates its role in the community and student leadership while home economics advocates the need to understand diversity of students.

In contrast, position predicted several significant differences in perceptions of critical competencies. One-half of the competencies were perceived differently based upon the type of position held. When significant differences between position resulted, it was most likely to be between teacher educators and the beginning teacher and his/her principal. This finding is somewhat alarming as teacher educators are those who are preparing the first year teacher for his/her entry into the profession. Presumably, teacher educators should be realistic and help the emerging teacher know what to do that first year of teaching. This study indicates that teacher educators are at greatest odds with other educators as to which is a critical competency and what is a secondary competency.

Using Fuller's notion of beginning teacher concerns, it appears that beginning home economics and agriculture teachers and their principals responded to those critical competencies which would address the concern for self survival in the classroom. Although not significantly different, beginning teachers and principals did rate classroom control, instruction and facility management as more critical than did other groups. Consequently, less importance was given to other competencies. In contrast, teacher educators and state supervisors felt that critical competencies included these other competencies such as program planning, student vocational organizations, professional development, and student uniqueness. According to Fuller's conceptualization, these competencies could be considered a shift in concern---from self to program, students, and profession. All of education, but especially teacher educators should take a long, hard look at this finding and critically question the current beliefs and practices at universities and colleges of teacher education. Perhaps the message that beginning teachers and their building principals is sending is on target and should be reflected upon.

To effectively address the issue of beginning teacher needs, key professionals such as teacher educators, state supervisors, principals and the beginning teachers must agree on what is most important for a novice teacher to survive. Communication is needed between these various constituencies to share stories, information, and ideas on what is necessary and less necessary for a first year of teaching. When this type of dialogue occurs, practices of inducting a new teacher can be shaped and implemented. This study found that discipline was not nearly the obstacle for agreement as was position. It appears that more communication and dialogue must occur between various positions within education. When this occurs, beginning teachers will benefit.

References

Block, M. C. & Griggs, M. B. (1988). Beginning home economics teachers: The nature of their work. Journal of Vocational Home Economics Education, 6(2), 44-52.

Camp, W. G. & Heath-Camp, B. (1991). A national survey of the experiences of beginning vocational teachers. Berkeley, CA: National Center for Research in Vocational Education. (ERIC Document Reproduction Service No. ED 332 040)

Camp, W. G. & Heath-Camp, B. (1991). On becoming a teacher: They just gave me a key and said, 'Good Luck'. Berkeley, CA: National Center for Research in Vocational Education. (ERIC Document Reproduction Service No. ED 335 517)

Camp, W. G. & Heath, B. (1988). On becoming a teacher: Vocational education and the induction process (NCRVE Monograph No. 018). Berkeley, CA: National Center for Research in Vocational Education.

Curtis, S. M. (1985). Profiles of teachers of agriculture in Pennsylvania. Pennsylvania Agricultural Education, 64(7). University Park: The Pennsylvania State University, Department of Agricultural and Extension Education.

Fuller, F. F. (1969). Concerns of teachers: A developmental conceptualization. American Educational Research Journal, 6(2), 207-226.

Gardner, D. P. (1983). A nation at risk: The imperative for educational reform. Washington, DC: National Commission on Excellence in Education.

Griffin, G. A., Barnes, S., Defino, M., Edwards, S., Hoffman, J., Hukill, H., & O'Neal, S. (1983). Teacher induction: Research design for a descriptive study. Austin, TX: Research and Development Center for Teacher Education.

Heath-Camp, B. & Camp, W. G. (1992). Assistance needed and received by beginning vocational teachers. Journal of Vocational Education Research, 17(1), 35-52.

Heath, B., Camp, W. G. & Barber, J. D. (1988). Induction needs of professionally trained beginning vocational teachers. In W. G. Camp & B. Heath (Eds.), On becoming a teacher: Vocational education and the induction process (pp. 53-68). Berkeley, CA: National Center for Research in Vocational Education.

Howey, K. R. & Zimpher, N. L. (1989). Preservice teacher educators' role in programs for beginning teachers. The Elementary School Journal, 89(4), 451-470.

Jensen, M. C. (1986). Induction programs support new teachers and strengthen their school. Eugene, OR: Oregon School Study Council. (ERIC Document Reproduction Service No. ED 273 012).

Varah, L. J. (1985). Teacher induction program. Denver, CO: National Council of States on Inservice Education. (ERIC Document Reproduction Service No. ED 265 150).

PERCEPTIONS OF CRITICAL COMPETENCIES FOR THE SURVIVAL OF BEGINNING AGRICULTURE AND HOME ECONOMICS TEACHERS FROM FOUR EDUCATIONAL PERSPECTIVES

A Critique

Alfred J. Mannebach, The University of Connecticut--Discussant

Contributions and Significance of the Research

The first year of teaching is crucial to the success of beginning teachers. Every effort must be made to help them gain confidence and competence, be successful, and experience a supportive induction phase. The researchers have conducted a meaningful study. Results indicate that there is likely to be more discrepancy within the various groups of educators in the same field studied than there is to be among different fields. Another finding was that there is little agreement among groups on the rank order of critical responsibilities for beginning teachers. One alarming finding was that teacher educators differed significantly from first year teachers and his/her principal on the definition of what is a critical competency and what is a secondary competency.

Procedural Considerations

The research procedures reported seem appropriate for the study. Efforts were made to equalize numbers of subjects in the sample. An acceptable (72 percent) response rate was obtained. Procedures for validating the instrument were reported, however, no mention is made regarding the source of the competencies identified or the manner in which the 70 competencies were grouped into competency scales. Such information would have added credibility to the instrument. The author is to be commended, however, for pilot testing the instrument with representatives of the population studied.

Comments and Questions

1. The researchers reported that questionnaires were mailed in two phases; in the fall of 1991 to state supervisors and teacher educators and in April of 1992 to beginning teachers and their principals. Why the time lag? What effect did that six month time period (history) have on the internal validity of the study? This major threat to the internal validity of the study should have been acknowledged.

2. I agree with the comments the researchers made regarding the need for increased communication among and between teacher educators, state supervisors, principals, and beginning teachers. However, in what additional activities could professionals become involved to obtain a more realistic and up to date view of the competencies needed by beginning teachers?

NAERM Third Session
10:30 a.m.-12:00 noon
Concurrent Session H

Theme: Adoption Diffusion Theory, Cognitive Abilities of Students in Colleges of Agriculture, and Opinions of College of Agriculture Graduates Concerning Curricular and Extracurricular Activities

Topic 1: Cognitive abilities of college of agriculture students across traditional content areas

Speakers: Robert Torres, Jamie Cano (The Ohio State University)

Topic 2: Opinions of graduates concerning the curricular and extra-curricular activities of the college of agricultural sciences

Speakers: Cynthia Wrye, Robert Terry, Jr. (Texas Tech University)

Topic 3: The efficacy of the adoption diffusion theory for agricultural education

Speaker: Timothy Rollins (The Pennsylvania State University)

Topic 4: The application of exploratory factor analysis in agricultural education research

Speaker: Matt Raven (Montana State University)

Discussant: Glen Shinn (Texas A&M University)

Chairperson: Tracy Hoover (University of Florida)

Facilitator: Arthur Berkey (Cornell University)

COGNITIVE ABILITIES OF COLLEGE OF AGRICULTURE STUDENTS ACROSS TRADITIONAL CONTENT AREAS

Robert M. Torres
Assistant Professor
Agricultural and Extension Education
New Mexico State University

Jamie Cano
Associate Professor
Agricultural Education
The Ohio State University

Introduction

Dale (1978, p. 37) stated "for many years we have talked about education in a changing society, but have done little to educate for uncertainty." The use of thinking skills on problem situations is universally recognized to be an important objective for any educational institute. Pascarella (1985) suggested that there was substantial and consistent evidence to support the contention that students typically "knew" more when they left college as seniors than when they entered as freshmen. However, are students taught to think? Lochhead and Clements (1979, p. 1) asserted "we should be teaching students how to think; instead, we are primarily teaching them what to think."

Teaching students how to think has been identified as a goal of educators in colleges of agriculture (Miller, 1989). Foster and Pikkert (1991) indicated that if students in colleges of agriculture were be competitive in a world in which technology was changing more and more rapidly, agricultural faculty needed to be able to provide their students the cognitive abilities that would enable them to solve problems, make decisions, and integrate new technology outside of the classroom.

Developing cognitive abilities in students enrolled in colleges of agriculture has been advocated by several researchers and educators (Pickford, 1988; Newcomb & Trefz, 1987; Miller, 1990; Newcomb & Whittington, 1990, 1992; Kuhns, 1977; Johnson & Birkenholz, 1990). Unlike physical abilities, cognitive abilities do not remain static across the span of one's life (Halpern, 1986) rather, cognitive abilities can be modified through instructional intervention (Beggs & Mouw, 1989). However, do educators know at what level of cognition students enrolled in colleges of agriculture function? Furthermore, is there a relationship between students' characteristics and their cognitive ability?

Purpose and Research Questions

The purpose of this study was to describe the cognitive abilities of students enrolled in a College of Agriculture on three content areas. Furthermore, the study sought to describe the relationships between cognitive abilities on the three content areas and characteristics of students enrolled in the College of Agriculture. The following specific research questions were examined:

1. What were the characteristics (age, cumulative GPA, ACT composite score, gender) of students enrolled in the College of Agriculture?

2. What were the cognitive abilities on three content areas (Verbal, Quantitative, Spatial) of students enrolled in the College of Agriculture as measured by the DCAT?

3. What were the relationships between students' cognitive abilities on three content areas (Verbal, Quantitative, Spatial) and their characteristics (age, cumulative GPA, ACT composite score, gender)?

Procedures

The target population for the descriptive-relational study was senior students enrolled in the College of Agriculture at The Ohio State University during the Autumn Quarter, 1992 (N=388). An up-to-date list of names was obtained from the College Office and served as the frame for the study. A random sample of 196 students was drawn from the population of senior students. The sample size (n=196) was determined using Krejcie and Morgan's (1970) table of sample sizes, specifying a five percent margin of error.

A personalogical information instrument, developed by one of the researchers, was used to gather data on students' age, cumulative GPA, ACT composite score, and gender. All personalogical information was obtained from student college records to ensure accuracy.

The Developing Cognitive Abilities Test (DCAT) (Beggs & Mouw, 1989) was used to assess the cognitive abilities of students on three content areas (Verbal, Quantitative, Spatial) using items reflecting three levels of cognition (Basic Cognitive Abilities, Application Abilities, Critical Thinking Abilities). Beggs and Mouw (1989) indicated that results on the cognitive dimensions provided unique information that could assist educators in identifying the level of thinking ability across the traditional content areas.

The DCAT was considered to be a standardized instrument and has been assessed for content validity and reliability (Wick, 1990). The reliability coefficients (Kuder-Richardson-20) were established by the developers of the instrument on the three content areas: Verbal, .80; Quantitative, .84; Spatial, .75; and overall, .90 (Beggs & Mouw, 1989).

Data collection began by mailing to students a letter of invitation strongly encouraging participation in the study. The letter was structured according to Dillman (1978) and specified four dates and times with two data collection sessions on each date. The data collection dates were selected with careful attention given to avoid exam dates, holidays, and weekends. Students were invited to attend one of the eight sessions offered. Students were able to indicate their willingness to participate on a self-addressed stamped post card. Telephone calls were made 10 days after the initial mailing to follow-up students' willingness to participate in the study. A make-up data collection session was offered to students not able to attend their scheduled session. All data collection session were located in the same room.

A total of 47% (92) of the students in the sample participated in one of the eight scheduled and one make-up data collection session. Students who did not participate in the study were treated as non-respondents and considered to be non-response error. Non-response error was controlled by sampling the non-respondents and comparing them with the respondents. A sample of 10% of the non-respondents (n=11) was randomly drawn and statistically compared to the sample of respondents (n=92) on variables of interest as was suggested by Miller and Smith (1983). No significant differences (p>.05) were found to exist between the sample of non-respondents and respondents. Thus, the non-respondent data were pooled with the respondent data yielding a sample size of 103 (53.0%) allowing generalization to the sample/population (Miller & Smith, 1983).

Analysis of Data

The data were analyzed using SPSS/PC+. Descriptive statistics such as central tendencies, variances, ranges, and modes were used to describe the data. Pearson product-moment correlation coefficients and point-biserial correlation coefficients were calculated to describe relationships between variables. The magnitude of the relationships were interpreted using Davis' (1971) conventions. An alpha level of .05 was set a priori.

Results

Personalogical data were gather on 103 senior students enrolled in the College of Agriculture during the Autumn Quarter, 1992. Personalogical data included age, cumulative GPA, ACT composite score, and gender. The ensuing results are a description of the personalogical variables (Table 1).

Table 1
Personalogical Characteristics of Senior Students Enrolled in the College of Agriculture

Characteristic	n	Mean	Std. Dev.	Range
Age	103	23.70	4.14	22 - 41
Cumulative GPA	103	2.75	.57	1.84 - 3.98
ACT Composite Score	84	21.26	4.22	9 - 31
Gender	n	Percent		
Male	59	57.3		
Female	44	42.7		

The age of senior students ranged from 22 to 41 years of age. The mean age for the senior students was 23.7 years. The mode age of senior students was 22 years of age. The cumulative GPA of senior students ranged from 1.84 to 3.98. The mean cumulative GPA for senior students was 2.75.

Of the 103 senior students, an ACT composite score was available for 84 students (82.0%). For the 84 senior students, ACT composite scores ranged from 9 to 31. The means ACT composite score for the 84 senior students was 21.26. The mode ACT composite score was 24. In addition, of the 103 senior students who participated in the study, 57.3 percent (59) were male and 42.7 percent (44) were female (Table 1).

Senior students' cognitive abilities scores on three content areas were gathered utilizing the Developing Cognitive Abilities Test (DCAT) (Beggs & Mouw, 1989). The three content areas of cognitive abilities were: Verbal, Quantitative, and Spatial. For each of the cognitive ability content areas, a maximum raw score of 27 was possible (Table 2).

Table 2
Cognitive Abilities Scores by Content Area of Senior Students Enrolled in the College of Agriculture (n=103)

Content Area	Mean	Std. Dev.	Range
Verbal	21.9	2.97	15 - 27
Quantitative	20.2	4.50	7 - 27
Spatial	14.9	4.23	2 - 24

Note. Raw scores are based on a maximum possible score of 27.

The raw scores on the Verbal cognitive abilities items of the DCAT for senior students ranged from 15 to 27. The raw mean score for senior students on the Verbal cognitive abilities items was 21.9. The raw score of the Quantitative cognitive abilities items for senior students ranged from 7 to 27. The raw mean score for the Quantitative cognitive abilities items was 20.2. In addition, the range of raw scores for senior students on the Spatial cognitive abilities items was 2 to 24. The raw mean score for the Spatial cognitive abilities items was 14.9 (Table 2).

Pearson product-moment correlations (r) were calculated among senior students' Verbal, Quantitative, and Spatial cognitive abilities score and age, cumulative GPA, and ACT composite score. Point-biserial correlation coefficients (r_{pb}) were calculated between students' Verbal, Quantitative, and Spatial cognitive abilities score and gender. All correlation coefficients were based on n=103 with the exception of ACT composite score correlates. ACT composite correlation coefficients were based on n=84 (Table 3).

Table 3
Pearson Product-Moment Correlation Coefficients Between Senior Students' Personalogical Characteristics and Their Cognitive Abilities Scores by Content Area (n=103)

	Content Area		
Characteristics	Verbal	Quantitative	Spatial
Age	.29*	.00	-.26*
Cumulative GPA	.28*	.47*	.37*
ACT Composite Score[a]	.50	.39	.35
Gender[b]	-.29	.15	.12

Note. a: Coefficients are based on n=84.
b: Correlations are expressed as Point-biserial coefficients;
Dummy coded as 0=female and 1=male.
*p<.05

The relationship between senior students' Verbal cognitive abilities score and age was low, positive, and significant (r=.29, p<.05). There was also a significant and low positive relationship between senior students' Verbal cognitive abilities score and cumulative GPA (r=.28, p<.05). There was a substantial and positive relationship (r=.50) between senior students' Verbal cognitive abilities score and ACT composite score. In addition, there was a non-significant, negative, and negligible relationship (r_{pb}=-.09, p>.05) between Verbal cognitive abilities score and gender.

With regards to Quantitative cognitive abilities, the relationship between senior students' Quantitative cognitive abilities score and age was non-existent (r=.00). There was a significant and moderately positive relationship between Quantitative cognitive abilities score and cumulative GPA (r=.47, p<.05). The relationship between senior students' Quantitative cognitive abilities score and ACT composite score was significant and moderately positive (r=.39). In addition, the relationship between senior students' Quantitative cognitive abilities score and gender was non-significant, positive, and low (r_{pb}=.15, p>.05).

Pertaining to Spatial cognitive abilities, the relationship between senior students' Spatial cognitive abilities score and age was significant, low, and negative (r=-.26, p<.05). There was a significant and moderately positive relationship between Spatial cognitive abilities score and cumulative GPA ($r=.37$, $p<.05$). The relationship between senior students' Spatial cognitive abilities score and ACT composite score was moderately positive ($r=.35$). In addition, the relationship between senior students' Spatial cognitive abilities and gender was non-significant, positive, and low ($r_{pb}=.12$, $p>.05$).

Conclusions and/or Recommendations

It was concluded that senior students tended to score highest on Verbal cognitive abilities items than on Quantitative cognitive abilities items and Spatial Abilities items. Conversely, senior students tended to score lowest on Spatial Abilities items than on Verbal cognitive abilities and Quantitative cognitive abilities. To aid in interpretation, raw scores were converted into percentages. Senior students, on the average, scored an 81.1% on the Verbal cognitive abilities content area. Similarly, senior students, on the average, scored a 74.8 percent on the Quantitative cognitive abilities content area. In addition, senior students, on the average scored, of 55.2% on the Spatial Cognitive abilities content area. No comparable data of a similar group of students were available; however, the results reported herein serve as baseline data for future studies of students enrolled in colleges of agriculture.

It is recommended that further research be conducted on the cognitive abilities of students enrolled in the colleges of agriculture. Specifically, research should be conducted to determine actual cognitive abilities gains as a result of their college education. Cognitive abilities of students enrolled in colleges of agriculture should be assessed as entering freshmen, then again as seniors to determine actual cognitive gains. Additionally, independent samples of students should be drawn from each academic area (majors) in colleges of agriculture to determine cognitive differences by content area for each academic area.

Regarding the relationships between senior students' cognitive abilities across the three content areas (Verbal, Quantitative, Spatial) and age, it was concluded that older senior students tended to score greater on abilities requiring understanding and use of words - verbal abilities. Conversely, younger senior students tended to score greater on abilities requiring understanding objects (i.e., size, shape, dimension, transformational properties) and how the objects behave - quantitative abilities.

It was concluded that the greater the senior students' cumulative GPA, the greater their score on abilities requiring the understanding and use of words, the elements of number theory which include arithmetic operations and basic geometric and trigonometric operations, and in understanding objects (i.e., size, shape, dimension, transformational properties) and how they behave. Additionally, it was concluded that for senior students whose ACT composite score was available, the greater the ACT composite score, the greater the score on abilities requiring the understanding and use of words, the elements of number theory which include arithmetic operations and basic geometric and trigonometric operations, and in understanding objects (i.e., size, shape, dimension, transformational properties) and how the objects behave.

Furthermore, for students in the study, it was concluded that female senior students, when compared to male senior students, tended to score greater on abilities requiring the understanding and use of words. Conversely, male senior students tended to score greater than female senior students on abilities requiring understanding the elements of number theory which include arithmetic operations and basic geometric and trigonometric operations. Similarly, male senior students tended to score greater than female senior students on abilities in understanding objects (i.e., size, shape, dimension, transformational properties) and how the objects behave. These data were consistent with and supports the literature on gender differences (Halpern, 1986; Plake, Loyd, & Hoover, 1981; Burnett, Lane, & Dratt, 1979; Mandler & Stein, 1977; McGee, 1979).

Beggs and Mouw (1989) indicated that the DCAT results could be used to identify students' strengths, weaknesses, and abilities that could be developed through instructional intervention. Thus, curriculum taught in colleges of agriculture should compliment and reinforce the content area (Verbal, Quantitative, Spatial) needed to succeed at certain tasks in the future. Instructional interventions should also occur on the three content areas (Verbal, Quantitative, Spatial) to reduce and minimize gender differences. Although usually not part of the curriculum, in particular, senior students need strengthening in Spatial abilities.

References

Beggs, D. L. & Mouw, J. T. (1989). Assessing dimensions of ability. In American Testronics, Developing Cognitive Ability Test: Comprehensive assessment program. Chicago: American Testronics.

Burnett, S. A., Lane, D. M., & Dratt, L. M. (1979). Spatial visualization and sex differences in quantitative ability. Intelligence, 3, 345-354.

Dale, E. (1978). The good mind. Bloomington, IN: Phi Delta Kappa Educational Foundation.

Davis, J. A. (1971). Elementary survey analysis. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Dillman, D. A. (1978). Mail and telephone surveys: The total design method. New York: John Wiley & Sons.

Foster, R. M. & Pikkert, J. J. (1991, December). Perceptions of agriculture college faculty regarding integration of higher order level skills in the curriculum. NACTA Journal, 35(4), 23-25.

Halpern, D. F. (1986). Sex differences in cognitive abilities. Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Johnson, D. M. & Birkenholz, R. J. (1990, March). Levels of cognition required in undergraduate agriculture courses. NACTA Journal, 34(1), 39-40.

Krejcie, R. V. & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30, 607-710.

Kuhns, L. J. (1977, June). Teaching for permanent learning. NACTA Journal, 21(2), 14-16.

Lochhead, J. & Clements, J. (1979). Cognitive process instruction: Research on teaching thinking skills. Proceeding of Conference held at the University of Massachusetts, Amherst. (ERIC Document Reproduction Service No. ED 234 997)

Mandler, J. M. & Stein, N. L. (1977). The myth of perceptual defect: Sources and evidence. Psychological Bulletin, 84, 173-192.

McGee, M. G. (1979). Human spatial abilities: Psychometric studies and environmental, genetic, hormonal, and neurological influences. Psychological Bulletin, 86, 889-918.

Miller, C. (1989). Cognitive levels of instruction and student performance in college of agriculture courses. Unpublished doctoral dissertation. Columbus: The Ohio State University.

Miller, C. (1990). Cognitive levels of instruction and student performance in selected colleges of agriculture courses. Proceeding of the Central Region 44th Annual Research Conference in Agricultural Education. Chicago, IL.

Miller, L. E.& Smith, K. (1983). Handling nonresponse issues. Journal of Extension, 24, 45-50.

Newcomb, L. H. & Trefz, M. K. (1987, February). Levels of cognition of student tests and assignments in the College of Agriculture at The Ohio State University. Proceedings of the Central Region 41st Annual Research Conference in Agricultural Education, Chicago.

Newcomb, L. H. & Whittington, M. S. (1992, June). Raising cognitive levels of college classroom instruction. NACTA Journal, 36(2), 8-11.

Pascarella, E. T. (1985). College environmental influences on learning and cognitive development. In John C. Smart (Ed.), Higher education: Handbook of theory and research, 1. New York: Agathon Press, Inc.

Plake, B. S., Loyd, B. H., & Hoover, H. D. (1981). Sex differences in mathematics components of the Iowa Test of Basic Skills. Psychology of Women Quarterly, 5, 780-784.

Pickford, J. C. (1988). Selected student and professor variables related to cognitive achievement in College of Agriculture Courses. Unpublished master's thesis. Columbus: The Ohio State University.

Whittington, M. S. & Newcomb, L. H. (1990, June). Teaching at higher levels of Cognition. NACTA Journal, 34(20), 20-23.

Wick, J. W. (1990). Developing cognitive abilities test. Technical Manual (Republication edition). Chicago: American Testronics.

COGNITIVE ABILITIES OF COLLEGE OF AGRICULTURE STUDENTS ACROSS TRADITIONAL CONTENT AREAS

A Critique

Glen C. Shinn, Texas A&M University, Discussant

A better understanding of cognitive abilities and their relationships is an important point of inquiry. One of the overriding goals of education should be to enhance cognitive abilities. This is an entry approach to better understand and describe cognitive abilities of senior university students at The Ohio State University.

The authors recognize that thinking skills should be enhanced. However, this research does not attempt to assess the thinking skills of students, rather to assess the potential or capacity for thinking.

The purposes as described in the paper were satisfied. The student characteristics and relationships were described. However, the larger question was left unanswered---are we teaching students how to think?

The findings and conclusions were consistent with the current literature. The researchers appear to be reluctant to make recommendations for future research which would explore thinking skills and their development.

What are the "educational interventions" that foster and reinforce thinking skills? By what method should educators attempt to enhance thinking skills? This research leaves these really important questions pending.

OPINIONS OF GRADUATES CONCERNING THE CURRICULAR AND EXTRA-CURRICULAR ACTIVITIES OF THE COLLEGE OF AGRICULTURAL SCIENCES

Cynthia L. Wrye, Graduate Assistant
Robert Terry, Jr., Assistant Professor
Department of Agricultural Education and Communications
Texas Tech University

Introduction

There are a variety of reasons for evaluating educational programs in colleges of agriculture. These evaluations are conducted in a numerous ways including through faculty and administrative input, assessment of industry needs, and follow-up of graduates. Cheek & McGhee (1990) contended that follow-up studies are one of the most commonly used measures in evaluating programs.

Because agriculture is dynamic, curricula needs to be reviewed often to meet the demands of the evolving technical information and the constantly changing occupational requirements in the discipline. In higher education, there appears to be a negative perception among students concerning employment opportunities in agriculture (Hoover & Scanlon, 1991). Therefore, it is necessary for recruitment and retention purposes for advisors to know the occupational status of their graduates.

Graduates can provide valuable information concerning extracurricular activities as well. In a study conducted by Major (1988), graduates reported that involvement in departmental and college clubs and organizations was important to them in developing career opportunities. Cheek and McGhee (1990) assessed graduates participation and perceptions about student organizations and concluded that they help graduates work with people in their careers.

A follow up study can also provide a unique perspective in evaluating the quality of instruction in college programs. Graduates are able to assess their learning experiences as a whole rather than on a course by course level as is the case with most teacher evaluations.

The outcomes of graduate follow-up studies can be revealing. They can provide information about student needs, expectations and the perceptions of their educational experience (Paret, 1991). Positive feedback from university graduates about their career status and success can be utilized as a public relations vehicle for college recruiting, as well as by employers seeking qualified candidates (Jackson, 1984). Major (1988) suggested that follow-up studies yield data that can be used to ensure efficient advisement of students, and the importance of involvement in extracurricular activities on campus.

Purpose and Objectives

The purposes of this study were to determine the occupational status of recent graduates of the College of Agricultural Sciences at Texas Tech University and to evaluate their opinions concerning curricular and extra-curricular programs in the College. Answers to the following questions were sought as a means of accomplishing the purposes of this study:

1. What are the personal characteristics and the occupational status of recent graduates from the College of Agricultural Sciences at Texas Tech University?

2. What are the graduates' perceptions of their educational experience in the College of Agricultural Sciences at Texas Tech University?

3. What are the graduates' perceptions of the academic advisement in the College of Agricultural Sciences at Texas Tech University?

4. What are the graduates' perceptions of the value of student organizations in the College of Agricultural Sciences at Texas Tech University?

5. What are the graduates' perceptions regarding the curriculum offered in the College of Agricultural Sciences at Texas Tech University?

Methods and Procedures

Population and Sample

The population was all students of the College of Agricultural Sciences at Texas Tech University who graduated from May 1987 through December 1991. The sample was a stratified random sample from each of the six departments in the College. This method was used in order to receive a response to accurately represent the population. In all, 660 of the 997 graduates who were in the population were included in the sample. Sample procedures followed the suggestions of Krejcie and Morgan (1970).

Instrumentation

The instrument used to collect data was developed by the researchers. It consisted of six sections: (1) demographic characteristics; (2) occupational information; (3) perceptions of educational experiences; (4) perceptions of advisement; (5) opinions of curriculum; and, (6) perceptions of extracurricular activities.

The questionnaire format was designed using a variety of questioning and response techniques. In determining the graduates' current occupation, respondents were asked to list their current occupation. Responses were then categorized into one of the employment clusters established by the United States Department of Agriculture (USDA) (Coulter, Goecker, & Slanton, 1990).

Graduates' perceptions of their educational experience was determined using a semantic differential scale using seven, bi-polar items. The bi-polar items were: valuable/not valuable; good/bad; pleasant/unpleasant; strong/weak; successful/unsuccessful, satisfactory/unsatisfactory.

Perceptions about academic advisement were examined using a five-point, Likert-type scale with the following response choices: excellent, good, average, fair, and poor. The same scale was used for response choices for inquires about the graduates' perceptions about the curriculum. Graduates were also asked for information about the quality of teaching in the College of Agricultural Sciences and teaching outside the College. Here, a 5-point, Likert-type scale was used with the following choices: strongly agree; agree; undecided; disagree; strongly disagree.

In determining the importance of extracurricular activities, the graduates were first asked in which activities they took part. Respondents were to circle one or more of the following responses: departmental organizations; agriculture council; judging teams; honorary societies; student government; fraternity/sorority; other--please list; and, none.

Collection of Data

The questionnaire was mailed to individuals selected to be in the sample. A letter of introduction and postage-paid return envelope accompanied the instrument. Three follow-up letters were sent to non-respondents with a copy of the instrument included with the second follow-up letter. Completed questionnaires were coded and keyed into microcomputer files.

Of the 660 questionnaires sent, 375 responses were collected for a response rate of 57%. Using the procedure outlined by Miller and Smith (1983), early and late respondents were compared to determine if there might be any differences between respondents and non-respondents. Since there were no significant differences between early and late respondents, these findings were generalized to the population.

Data Analysis

Data were analyzed using SPSS for the Macintosh. Frequencies and percentages were used to develop a profile of the respondents. The Mann-Whitney and Wilcoxon Rank Sum tests were used to check for significant differences between selected groups included in the study. These non-parametric statistics were used due to the ordinal nature of the dependent variables. A probability of $< .05$ was used to determine significance on all tests.

Results

Personal Characteristics and Occupational Status of Graduates

The respondents' characteristics were very comparable to the known characteristics of the population (major and gender). The occupations of the respondents were categorized into groups established by the USDA. The largest number of graduates were employed in the Scientist, Engineer or Related Specialist cluster (22.7%). Nearly 21% were employed in the Agricultural Production Specialist cluster, more than 19% were in the Manager, Financial Specialist group, and 17.6% were in the Marketing, Merchandising, or Sales cluster. There were nearly 15% employed in the Education, Communications Information Specialists, and fewer than 5% employed in the area of Social Services Professionals. Figure 1 illustrates the distribution of Texas Tech graduates in each USDA occupational category.

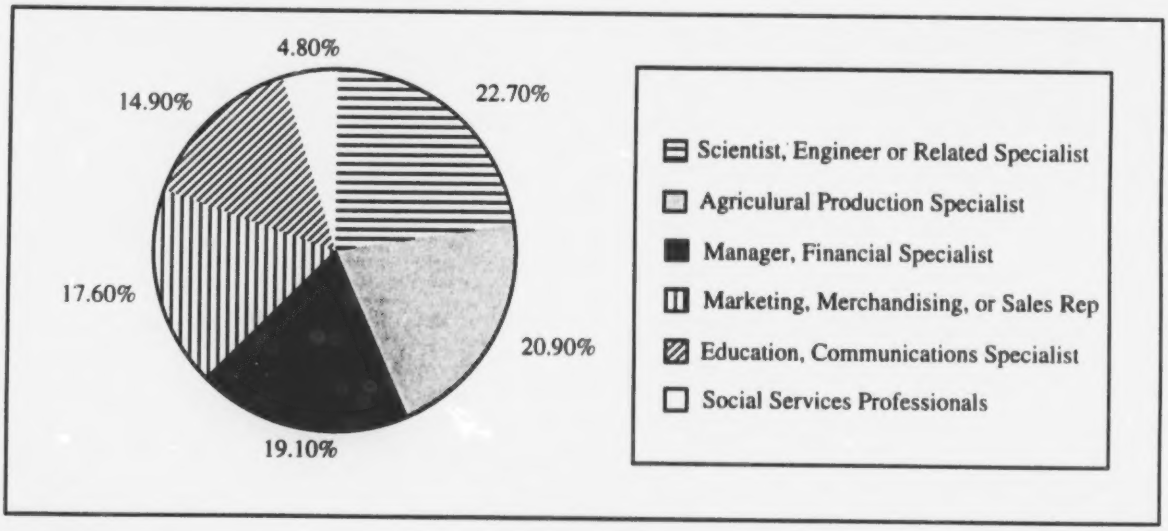


Figure 1
Distribution of Respondents by USDA Occupational Cluster

Respondents reported their annual gross income. The greatest number of graduates (45.0%) indicated that they made $20,000-$29,999. Less than 27% of the respondents made less than $20,000 and more than 28% made $30,000 or more.

Graduates' Perceptions of the Educational Experience

When asked if they would again enroll in the College of Agricultural Sciences at Texas Tech University, 83% of the respondents indicated they would. Ninety percent of the graduates from the Departments of Agronomy, Horticulture and Entomology; Range and Wildlife Management; and Agricultural Education and Communications said they would enroll again. More than 82% of the respondents who graduated from the Department of Animal Science, and more than 80% of those from the Department of Agricultural Economics said they would enroll again. Only 62% of the gradates from the Department of Park Administration and Landscape Architecture said they would enroll in that department again.

Respondents were asked to rate the professors within the College of Agricultural Sciences as well as those from outside the College on the following factors: Clarity, Enthusiasm, Variety, Student Interaction, and Organization. On each of the five factors, respondents rated professors from the College of Agricultural Sciences higher than professors from other colleges. A summary of the Wilcoxon analyses is reported in Table 1.

Table 1
Wilcoxon Analysis of Teaching Characteristics of Professors Within and Outside the College of Agricultural Sciences

Teacher Characteristic/ Faculty	Cases	Mean Rank	Z Score	p
Clarity				
College of Agricultural Sciences	146	89.6	-9.69	.0000
Other Colleges	21	45.3		
Tie	180			
Enthusiasm				
College of Agricultural Sciences	160	101.8	9.32	.0000
Other Colleges	31	65.8		
Tie	157			
Interaction with Students				
College of Agricultural Sciences	208	124.5	11.34	.0000
Other Colleges	28	74.3		
Tie	113			
Variety of Methods Used				
College of Agricultural Sciences	240	158.5	-8.27	.0000
Other Colleges	74	154.3		
Tie	34			
Organization				
College of Agricultural Sciences	113	78.5	5.63	.0000
Other Colleges	39	70.6		
Tie	193			

Graduates' Perceptions of their Academic Advisement

Nearly 40% of the respondents indicated that their academic advisement was excellent. About one-third of the graduates felt their advisement was good with nearly 15% indicating their advisement was average. Less than 14% of the graduates stated that their academic advisement was with fair or poor.

When broken down by department, graduates from the Department of Agricultural Education and Communications rated their advisement highest compared to graduates from other departments with a mean ranking of 4.09%. Animal Science graduates rated their advisement at 4.00%, followed by Agronomy, Horticulture and Entomology with 3.90%, Agricultural Economics with 3.81%, Park Administration and Landscape Architecture with 3.74%, and Range and Wildlife Management with 3.54% (see Figure 2).

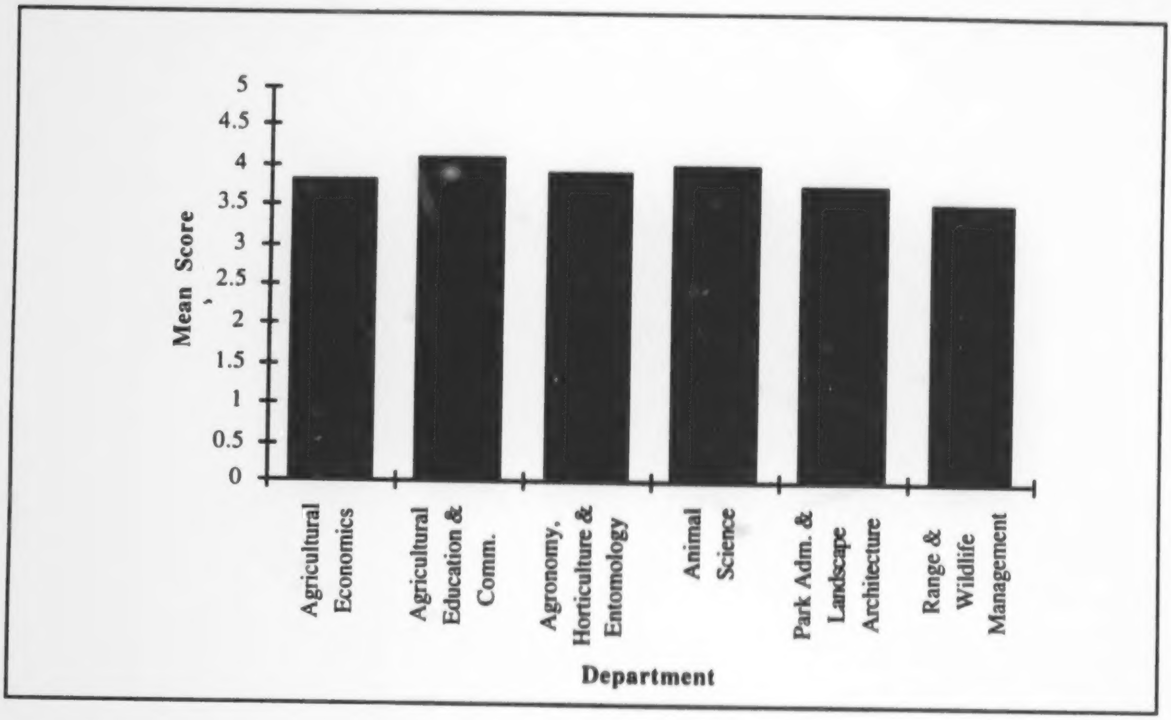


Figure 2
Rating of Quality of Advisement for Each Department

Graduates' Perceptions about Extracurricular Activities

More than 90% of the respondents were involved in one or more extracurricular activities while they were working on their degrees. Over 72% of the graduates took part in departmental clubs, nearly 20% were involved in the College of Agricultural Sciences Student Council, more than 14% were members of judging teams and nearly 30% were in at least one honorary organization. Less than 29% were involved in social fraternities or sororities and 4.5% took part in student government (see Table 2).

Table 2
Graduates Participation in Extracurricular Activities.

Club/Organization	Frequency	Percent
Departmental Clubs	258	72.1
Honorary Fraternity	105	29.5
Social Fraternity/Sorority	102	28.7
College of Agricultural Sciences Student Council	69	19.4
Judging Teams	51	14.3
Student Government	16	4.5
None of the Above	34	9.6

In excess of 95% of the respondents indicated that students should get involved in extracurricular activities. When the benefits of involvement in extracurricular activities were assessed, develop team work (4.03) and build responsibility (3.83) were rated highest. In the areas of build occupational skills (3.47), help get a job (3.34), develop leadership (3.16), and help understand agriculture (3.16) extracurricular activities were rated to be of some benefit.

Graduates' Perceptions about Courses

When the graduates were asked their opinion of general education courses, just over 12.0% said they were excellent. More than 60% indicated that general education courses were good, nearly 20% said they were average, about 7% said they were fair. Less than 1% perceived general education courses to be poor.

Nearly 86% of the respondents believed that technical agriculture courses were either good or excellent. More than 9% indicated that agriculture courses were average, 3.0% stated they were fair, and less than 1% rated them as poor.

In the College of Agricultural Sciences, there was a significant difference between the ratings of courses with the graduates' major department and those outside their department. Graduates from each department rated courses higher than did non-majors.

Conclusions

1. Most of the respondents are employed in one of the following categories: Scientists, Engineers or Related Specialists; Agricultural Production Specialists; Managers and Financial Specialists.

2. The largest percentage of graduates from the College of Agricultural Sciences are earning between $20,000 and $29,999 per year.

3. The vast majority of the graduate from the College of Agricultural Sciences would enroll in the College again. More than 80% of the graduates from each department except the Department of Park Administration and Landscape Architecture stated they would enroll again.

4. The graduates rated teaching of the faculty from the College of Agricultural Sciences higher in clarity, variety, enthusiasm interaction with students, and organization than that of faculty from other colleges.

5. The vast majority of the graduates considered the quality of their academic advisement to be excellent or good.

6. Almost all of the graduates indicated that students should become involved in extra-curricular activities and most perceived that such involvement helps students to develop team work, build responsibility, develop occupational skills, get a job, develop leadership, and understand agriculture.

7. The vast majority of graduates perceive general education courses and technical agriculture courses to be excellent or good.

8. Graduates from each major in the College of Agricultural Sciences had a higher opinion of courses with their major than did non-majors.

Recommendations

1. Since graduates are entering a variety of fields, majors and courses that educate students for careers in each of the USDA occupations categories should continue to be offered.

2. Administrators and faculty should continue current practices that provide students with positive educational experiences including quality teaching and effective advisement.

3. Faculty from departments that had a comparatively high percentage of graduates who stated they would not enroll in that program if they had it to do over again should examine their programs to determine why this situation exists.

4. Students should be advised to become involved in extra-curricular activities because of the many benefits that they provide.

5. If professors outside of the College of Agricultural Sciences wish to improve their teaching evaluations by students from the College of Agricultural Sciences, they should review methods and procedures being used by teachers within the College of Agricultural Sciences.

References

Cheek, J. G. & McGhee, M. B. (1990). Assessment for the preparation and career patterns of agricultural education. Journal of Agricultural Education, 31(2), 17-22.

Coulter, K. J., Goecker, A. D., & Slanton, M. (1990). Employment opportunities for college graduates in food and agricultural sciences, agriculture, natural resources, and veterinary medicine. Washington, DC: United States Department of Agriculture.

Hoover, T. S. & Scanlon, D. C. (1991). Recruitment practices: A national survey of agricultural educators. Journal of Agricultural Education, 32(3), 29-34.

Jackson, D. J. (1984). Career status of graduates: Implications for human development. (Report No. C60 17 651). Houston, TX: University of Houston University Park, Career Planning and Placement Center (ERIC Document Reproduction Service No. ED-247-491).

Krejcie, R. V. & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30, 607-610.

Major, B. R. A. (1988). Occupational status and educational needs of the College of Agricultural Sciences of Texas Tech University. Unpublished master's thesis, Lubbock: Texas Tech University.

Miller, L. E. & Smith, K. L. (1983). Handling nonresponse issues. Journal of Extension, 21 (5), 21-23.

Paret, A. M. (1991). A follow-up of female graduates of the College of Agriculture at Oklahoma State University from 1985 to 1989. NACTA Journal, 35(3), 46-49.

OPINIONS OF GRADUATES CONCERNING THE CURRICULAR AND EXTRA-CURRICULAR ACTIVITIES OF THE COLLEGE OF AGRICULTURAL SCIENCES

A Critique

Glen C. Shinn, Texas A&M University, Discussant

Although the research may not probe into theoretical issues, this study is useful to the faculty and administration in the College of Agricultural Sciences at Texas Tech University. Students are legitimate sources of opinion and should be involved in process and impact evaluations.

There is a wealth of knowledge about graduate satisfaction and benefits of extra-curricular activities. However, there was a rather weak connection between previous research and the assumptions which framed this study. Because the inquiry is not connected to career development theory, it has limited value in other institutional settings.

The purpose and objectives were straightforward and the procedures were sound. The sample was drawn from a stratified random sample from each of the six departments in the College. However, there was no information about subgroup size, sample sizes, student subgroup characteristics or percentage of returns by subgroup in each department.

It was not clear why a semantic differential scale was used to determine opinions of the experience when five point Likert-type scales were used to assess quality of teaching and advisement. It was also not clear how the bipolar items were converted to excellent, average, fair or poor.

In reporting the occupational status of graduates, the researchers accounted for 100 percent of the respondents. Does this mean that none of the Texas Tech University graduates are unemployed, employed outside the USDA clusters or in military service? Is this an error in reporting or a flaw in the respondent data?

The conclusions are a restatement of the findings. We can, however, conclude that the respondents were employed and very satisfied with their university curriculum. We can also conclude that the respondents recommend active participation in extra-curricular activities as a valuable part of their educational experience.

The recommendations to explore the apparent dissatisfaction of two programs is legitimate. Caution should be observed when one recommends methods in the College of Agricultural Science will improve teaching in other colleges.

THE EFFICACY OF THE ADOPTION DIFFUSION THEORY FOR AGRICULTURAL EDUCATION

Timothy J. Rollins
Assistant Professor
Agricultural and Extension Education
The Pennsylvania State University

Theoretical Background

Rogers (1962) defined the adoption process as the mental process an individual under-goes from the time he or she is made aware of an innovation to the time he or she adopts the innovation. The adoption of new ideas and practices is affected by at least five factors: 1) the type of decision involved in adoption; 2) the perceived attributes of the innovation; 3) the communication channels used; 4) the nature of the client system; and 5) the extent of the practitioner's effort (Lamble, 1984).

Lionberger (1982) explained the five steps of the adoption process: awareness, interest, evaluation, trial, and adoption. In the awareness stage, a person first learns about a new idea or practice. Diffusion of information creates awareness of innovation. In the second, or interest stage, a person actively seeks more information about the new concept or idea. The person then evaluates this information based on his or her individual situation. The fourth stage is the trial stage when a person experimentally puts the new idea or practice to use to determine whether or not they wish to adopt the innovation. The final stage, adoption, is reached when a person fully implements the idea or practice.

People do not adopt innovation at the same time (Rogers, 1962; Lionberger, 1982). Therefore, it is useful to place people into categories that describe their times of adoption based on their innovativeness. Two decades ago, Rogers and Shoemaker (1971) conducted research on adopter characteristics to enable diffusion agencies (i.e. Cooperative Extension) to appropriately categorize and address adopter audiences. They analyzed publications and summarized hundreds of empirical diffusion studies that either supported or did not support more than four dozen generalizations about technology adoption. Their findings related various independent variables to innovativeness (dependent variable) that were then grouped into three categories of generalizations: 1) socioeconomic status; 2) personality variables; and 3) communication behavior. For example, a socioeconomic generalization states that earlier adopters are no different from later adopters in age; a personality generalization states that earlier adopters have greater empathy than later adopters; and the communication behavior of an earlier adopter includes more contact with change agents than that of a later adopter.

Rogers' and Shoemaker's research produced five categories of adopters based upon innovativeness: laggards, late and early majority adopters, early adopters, and innovators. Although Reddy (1987) identified personal factors, such as age and education, that contribute to the adoption of technology, it was Rogers (1962) who earlier recognized that people do not adopt innovations simultaneously:

> *Innovators* are "venturesome ..., eager to try new ideas ...., desir[ing] the risky ..., cosmopolites". *Early adopters* are "respected by [their] peers ..., more integrated [into] the local social system ...., opinion leader[s] ...., localites". The *early majority* "interact frequently with their peers [and] ...may deliberate for some time before completely adopting a new idea ...and follow with deliberate willingness in adopting innovations, but seldom lead." "The *late majority* adopt new ideas just after the average member of a social system, ...[are] skeptical, and ...the pressure

of peers is necessary to motivate adoption." *Laggards* adopt innovation last, ...are traditional, and "tend to be frankly suspicious of innovations and change agents. ...The laggard's attention is fixed on the rear-view mirror" (pp. 248-250).

Rogers and Shoemaker (1971) defined innovativeness as "the degree to which an individual is relatively earlier in adopting new ideas than other members of his social system" (p. 27). Innovativeness indicates behavioral change resulting from diffusion. Innovativeness can also be used to classify people into adopter categories because it is a continuous variable that can be partitioned into discrete categories that are *exhaustive* (include all respondents of the sample), that are *mutually exclusive* to exclude respondents from other categories, and can be derived from *one classification principle* (Rogers, 1962).

Historically, the transfer of technology from a laboratory to a field has been a significant challenge for extension. The failure to recognize and address the psycho social component of technology adoption as part of the educational process has served to illustrate that generating knowledge is not always synonymous with diffusing and adopting knowledge (Barao, 1992). Riesenberg and Gor (1989) found that knowing farmers' preferences for receiving information would help program planners transfer information about innovative farming practices more effectively. In order to be an effective channel for the diffusion of information, change agents must be aware of their clients' innovativeness.

A major function of extension practitioners is to facilitate the adoption of new ideas and practices or to influence the rate of diffusion and adoption of innovations by their clients. An extension practitioner can inform and educate clients about innovations and technology by being a communicator, a facilitator, a program planner, an administrator, or implementor. To enhance their effectiveness as change agents, extension practitioners must understand the unique characteristics that describe their clientele system.

Purpose and Research Questions

One of the goals of social science is to provide an empirical base for understanding human behavior. The empirical prediction of behavior is not meaningful unless it is theoretically based and logically consistent. This study sought to determine which of fifteen generalizations (five from each of the three categories) selected from those studied by Rogers and Shoemaker (1971) were related to Pennsylvania farm operators' perceptions of their innovativeness. Could these generalizations be used to profile the different categories of adopters? The study was guided by the following research questions: 1) How do Pennsylvania farm operators perceive their innovativeness?; and 2) Which variables derived from Rogers' and Shoemaker's generalizations about innovativeness most accurately classify Pennsylvania farm operators?

Methods and Procedures

A descriptive correlational study was used to examine the nature and strength of the relationships between fifteen of the generalizations derived from Rogers' and Shoemaker's generalizations about innovativeness--socioeconomic status; personality; and communication behavior. The population frame consisted of 24,546 Pennsylvania farm operators whose unduplicated names and mailing addresses appeared on the Pennsylvania Department of Agriculture pesticide training or brucellosis test lists. It was determined from Oliver, Hinkle, and Hinkle (1983, 1985) that the minimum sample size should be 197 respondents based upon the *a priori* effect size (.10) and a .05 alpha. A computer-generated table of random numbers was used to select the initial random sample of farm operators whose telephone numbers were subsequently located in telephone directories at the Pennsylvania State University library. Farm operators were considered a "non-contact" and removed from the initial sample if their telephone number was unlisted or inaccurately listed in the telephone directory, or after three unsuccessful attempts (no answer, unavailable, or not at home) to contact them during weekdays from 7:30 a.m. until 9 p.m. (Frey, 1989). The random selection procedure was reiterated on two subsequent occasions (400 additional names and telephone numbers) to secure the minimum sample.

Two additional interviewers were trained by the researcher to implement the research protocol (telephone interview). The average length of time to conduct the telephone interview and secure the necessary information averaged eight minutes. All respondents were guaranteed anonymity and confidentiality of their answers. The total number of farm operators who were successfully contacted and asked to participate in the study totaled 279. Two hundred farm operators (72%) responded to the telephone survey that was conducted during the fall of 1991.

Instrumentation

An Adopter Characteristics Questionnaire was developed from generalizations about innovativeness (Rogers & Shoemaker, 1971). It was comprised of fifteen attitudinal statements positively correlated with innovativeness. The first of two parts consisted of nine questions with a 5-point, Likert-type scale that required farm operators to rate the following variables (1=never, 5 = all the time): Business Travel; Control of Future; Empathy; Use Person for Information; Use of Printed Material; Risks; Social Travel; Use of Extension; and Use of Personnel. The second part consisted of six questions with a 5-point Likert-type scale that required farm operators to rate the following variables (1 = not important, 5 = very important): New Concepts and Ideas; Credit; Education; Learn New Practices; Positive Changes; and Scientific Research. Three additional demographic questions produced the variables: Years of Education, Acres Farmed, and Age of the Respondent.

Content and face validity of the questionnaire were established by a panel of experts consisting of faculty and graduate students from the Department of Agricultural and Extension Education at The Pennsylvania State University. The Adopter Characteristics Questionnaire was field tested with three farm operators selected from the population prior to selection of the initial sample. Based upon their responses and comments from the department faculty and staff, the questionnaire was modified. The 15 attitudinal items were subjected to a Cronbach's reliability test *post hoc* yielding an alpha coefficient of .73 which allowed a summated index called "adopter score" that measured general attitudes toward adoption of innovations.

Findings

Ages of the Pennsylvania farm operators in this sample ranged from 19 to 76 years with a mean of almost 48 years (47.8). As a representative sample, they farmed an average of slightly more than 200 acres which is higher than the state average farm size (153 acres). The findings are presented in order of the two research questions posed for this study.

Research Question 1

Figure 1 (adapted from Rogers and Shoemaker, 1971, p. 182) uses the mean and standard deviation to divide the normal adopter distribution into the five adopter categories: innovators, early adopters, early majority, late majority, and laggards. Figure 1 reveals the distribution of 183 Pennsylvania farm operators based on their responses to the Adopter Characteristics Questionnaire. Twenty-one (11%) farm operators had adopter scores ranging from 23 to 41 (laggards) while 68 (37%) farm operators' adopter scores ranged from 42 through 49, classifying them as late majority adopters. Farm operators who were classified as early majority adopters numbered 61 (33%) and had adopter scores ranging from 50 to 56 while 33 (18%) farm operators who were classified as early adopters had scores ranging from 57 to 61. No farm operators in this sample were classified innovators as described in the theory.

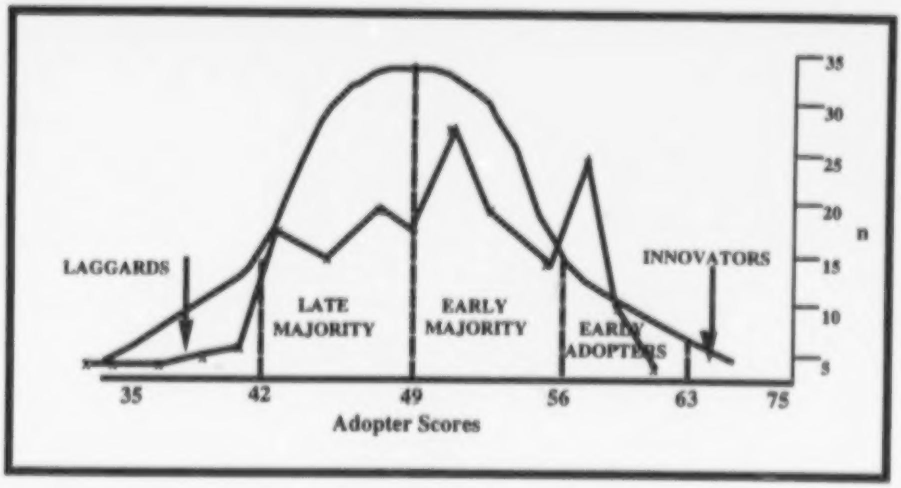


Figure 1.
Distribution of Adopter Categories and Pennsylvania Farm Operators.

Research Question 2

Discriminant analysis was used to identify relationships between the four adopter categories (no innovators were revealed) defined in this study and the quantitative predictor variables from the Adopter Characteristics Questionnaire. Two approaches were used for variable selection in the discriminant analyses. Direct-entry simultaneously forced variables into the discriminant analysis providing they satisfied the tolerance criterion (alpha = .05). The Wilks' method entered and removed variables one at a time on the basis of minimizing the overall Wilks' lambda. Examination of correlation matrices determined that no discriminating variables were linear combinations of other discriminating variables.

Table 1 reveals 15 variables that correctly classified 92% of the respondents (183) into one of the four adopter groups identified in this study--early adopters, early majority or late majority adopters, and laggards. Laggards were correctly classified in almost 90% of the cases (34/38) while 95% of the late majority adopters (61/64) were correctly classified. Almost 89% (55/62) of the early majority adopters were correctly classified while 100% of early adopters (19) were classified correctly. The discriminant analysis (Wilks' method) yielded a canonical correlation of .92 which explained 85% of the variance in classifying farm operators into the adopter groups.

Five variables that discriminated the early adopters (19 farmers) from the early and late majority adopters and laggards (133 farmers) are shown in Table 2. The model correctly classified 83% of the respondents and accounted for 19% of the variance in discriminating between early adopters and farmers classified in the other three categories.

Table 3 reports the results of a discriminant analysis to determine whether a discriminant function provided differentiation between the combined adopter categories of early adopters and early majority adopters compared to late majority adopters and laggards. Using the direct-entry, method, six variables--scientific research, positive changes, new concepts and ideas, use of personnel, empathy, credit, and business travel--correctly classified 89% of the innovators and early majority adopters from late majority adopters and laggards. Ninety-six percent of the combined group (81) of early adopters and early majority adopters were correctly classified compared to 83% of the combined group of late majority adopters and laggards (102). The

Table 1
Multiple Discriminant Model to Classify Pennsylvania Farm Operators' Innovativeness

Function Derived	Eigenvalue	Canonical R	Wilks Lambda	Chi-Square	df	Sig.
Innovativeness	5.24	.92	.135	329.13	45	<0.00
Variables Comprising Discriminant Function		F to Enter*	Wilks Lambda		Std. Discr. Coefficient	
Scientific Research		32.1	.64		.25	
New Concepts and Ideas		22.6	.51		.21	
Use of Personnel		19.2	.43		.20	
Empathy		17.0	.37		.42	
Social Travel		15.5	.33		.38	
Use of Extension		14.6	.29		.41	
Importance of Education		13.8	.25		.42	
Risks		13.3	.23		.40	
Credit		12.7	.21		.35	
Control of Future		12.1	.19		.35	
Use Person for Information		11.7	.17		.33	
Business Travel		11.4	.16		.37	
Positive Changes		11.0	.15		.29	
Learn New Practices		10.5	.14		.29	
Printed Material		10.0	.13		.19	

*$p < .05$, $df = 1, 172$.

Table 2
Discriminant Model for Early Adopters Compared to Other Farm Operators.

Function Derived	Eigenvalue	Canonical R	Wilks Lambda	Chi-Square	df	Sig.
Innovativeness	0.25	.44	.80	39.34	5	<0.00
Variables Comprising Discriminant Function		F to Enter*	Wilks Lambda		Std. Discr. Coefficient	
Use of Extension		12.1	.89		.59	
Empathy		6.2	.85		.41	
Business Travel		3.9	.83		.33	
Use of Personnel		3.0	.81		.30	
Control of Future		2.7	.80		.28	

*$p < .05$, $df = 1, 182$.

model yielded a canonical correlation of .74 and explained 55% of the variance in discriminating between the two groups of early adopters and early majority adopters and late majority adopters and laggards.

Table 4 reports six variables--social travel, importance of education, use of personnel, credit, use person for information, and business travel--correctly classified 89% of the laggards compared to the combined group comprised of early adopters and early and late majority adopters. Thirty-four of 38 respondents were correctly classified as laggards while 129 (89%) of the respondents were classified in the other group comprised of early adopters and early and late majority adopters which yielded a total of 89% correct classification for the model. The discriminant function yielded a canonical correlation of .67 that explained 45% of the variance.

Table 3
Discriminant Model for Early Adopters and Early Majority Adopters Compared to Late Majority Adopters and Laggards.

Function Derived	Eigenvalue	Canonical R	Wilks Lambda	Chi-Square	df	Sig.
Innovativeness	1.24	.74	.45	142.96	7	<0.00

Variables Comprising Discriminant Function	F to Enter*	Wilks Lambda	Std. Discr. Coefficient
Scientific Research	67.6	.73	.43
Use of Personnel	54.2	.62	.46
Positive Changes	46.2	.56	.32
Empathy	41.4	.52	.39
Business Travel	37.6	.48	.33
Credit	34.1	.46	.26
New Concepts and Ideas	30.9	.45	.27

*$p < .05$, $df = 1, 180$.

Table 4
Discriminant Model for Laggards Compared to Other Farm Operators.

Function Derived	Eigenvalue	Canonical R	Wilks Lambda	Chi-Square	df	Sig.
Innovativeness	.80	.67	.55	105.05	6	<0.00

Variables Comprising Discriminant Function	F to Enter*	Wilks Lambda	Std. Discr. Coefficient
Social Travel	30.5	.86	.48
Importance of Education	31.4	.74	.58
Use of Personnel	33.3	.64	.43
Credit	29.4	.60	.36
Use Person for Information	26.4	.57	.38
Business Travel	23.6	.55	.30

*$p < .05$, $df = 1, 182$.

Discussion of Findings

The respondents in this study can be characterized similarly to what Rogers and Shoemaker (1971) predicted when they described the continuum of innovativeness on the basis of two characteristics of a normal distribution, the mean and the standard deviation. Based upon scores from the Adopter Characteristics Questionnaire, 52% of the farm operators were classified as early adopters and early majority adopters and 48% were late majority adopters and laggards.

The first discriminant model developed for each of the four categories of adopters in this study correctly classified more than nine of every ten respondents and utilized fifteen variables. Three variables--the importance of scientific research, new concepts and ideas, and the frequency of use of personnel--alone explained 57% of the variance. Despite additional discriminant models that categorized adopters using fewer variables from the Adopter Characteristics Questionnaire, none of the models proved to be more accurate classifying adopters and none explained as much of the variance associated with innovativeness.

In the second discriminant model, the frequency of farm operators' use of extension, business travel, use of personnel, empathy, and control over the future discriminated 100% of the early adopters from the other combined groups of adopters. The first three variables were derived from Rogers' and Shoemaker's (1971) category of generalizations dealing with communication behavior; the latter two were associated with personality.

The third model discriminated early adopters and early majority adopters from the late majority adopters and laggards using seven variables: importance placed in scientific research, credit, new concepts and ideas, and making positive changes, as well as the frequency with which they used personnel from companies or agencies, traveled for business purposes, and empathized. Importance of credit was derived from a socio-economic generalization; three of each of the six remaining variables were derived from the generalizations associated with communication behavior and personality.

The frequency of use of personnel from companies or agencies, getting information from people, travel for business or social purposes, and importance of education and credit correctly classified laggards in nine out of ten cases (89%). The latter two variables were derived from socio-economic generalizations, the other variables with respondents' communication behavior.

Implications and Recommendations

This study validated fifteen of the generalizations provided by Rogers and Shoemaker (1971) about innovativeness; they were still useful to profile categories of adopters among the respondents. The potential still exists for educators to use these, and other generalizations, to maximize their effectiveness in facilitating the adoption of new ideas and practices by their clients. Despite the fact that no one set or group of independent variables repeatedly classified their innovativeness across the spectrum, these results can provide keen insights into techniques practitioners need to provide education and information about new technology to farmers.

According to this theory, if agricultural educators desired to pinpoint educational programming to have the greatest impact in implementing new fertilization practices to improve water quality in their realm of influence, they should seek out innovators or early adopters to provide necessary leadership. What traits ideally and accurately characterized these individuals? In this study, a majority of the explained variability in classifying Pennsylvania farm operators into one of the four categories of adopters (Table 1) was accounted for by three variables: 1) importance of scientific research; 2) learning about new concepts and ideas; and 3) the frequency with which they used personnel from other agencies and companies--besides Cooperative Extension.

In addition, this study raised the not-so-new issue that not all potential adopters of new technology used one information source exclusively. There are, in fact, a multitude of information sources available for farmers to utilize other than Cooperative Extension. Educators and effective change agents can best use the results from this study to target both cooperators and collaborators, as well as prospective clientele, who may not have been previously identified. The purveyance of technology, what once had been almost exclusively within Extension's domain, has now become a rather lucrative business for some individuals, as well as scientific laboratories, agribusiness and agrichemical corporations, and biotechnology agencies. In this age of increased accountability and declining fiscal resources, can't cooperative and collaborative relationships be forged that result in synergistic relationships mutually beneficial to all parties?

But simply knowing about an innovation does not necessarily guarantee it will be adopted. The innovation may not be regarded as relevant or useful by a potential adopter. Individuals adopting new technology or practices go through five identifiable steps--awareness-interest-evaluation-trial-and adoption--each of which have preferred information sources (Lionberger & Gwin, 1982). For example, innovators, who are the first to try new things, may provide local trials for others to see after they have read technical and research publications.

Thus, attitudes toward particular innovations can intervene between the knowledge and decision functions. Whereas the knowledge function involves mainly cognitive mental activity--knowing--the persuasion function to adopt the innovation is mainly affective. The client must form a favorable or unfavorable attitude or feeling toward the innovation. Indeed, this is an occasion, or teachable moment, when the educator or change agent can influence to the greatest degree possible whether the innovation will be adopted. In other words, some programs should be designed for specific audiences to inform or provide an awareness of the technology, while others should be designed to focus on generating interest in or for evaluating the technology.

Webster's New World Dictionary (1986) defines efficacy as "the power to produce effects or intended results; effectiveness." If educators are knowledgeable of the generalizations regarding adopters' socio-economic status, personality, and communication behaviors, as well as the five factors affecting the adoption of new ideas and practices--types of decision involved; perceived attributes of the innovation; channels of communication used; nature of their client system; and the extent of their effort--it appears that the efficacy of The Adoption Diffusion theory developed by Rogers and Shoemaker (1971) a quarter of a century ago can today become a viable tool favored by agricultural educators.

References

Barao, S. M. (1992). Behavioral aspects of technology adoption. Journal of Extension, 30(2), 13-15.

Frey, J. H. (1989). Survey research by telephone. New York: Sage Publications.

Lionberger, H. F. & Gwin, P. H. (1982). Communication strategies: A guide for agricultural change agents. Danville: The Interstate Printers and Publishers, Inc.

Lamble, W. (1984). Diffusion and adoption of innovations. In Donald J. Blackburn (Ed.), Extension handbook (pp. 32-41). Ontario: University of Guelph.

Oliver, J. D., Hinkle, D. E., & Hinkle, C. A. (1983). How large should the sample be? A question with no simple answer? Or . . . Educational and Psychological Measurement, 43(4), 1051-1060.

Oliver, J. D., Hinkle, D. E., & Hinkle, C. A. (1985). How large should the sample be? Part II-The one sample case for survey research. Educational and Psychological Measurement 45(1), 271-280.

Reddy, A. A. (1987). Adoption and diffusion of farm information. In Extension Education (pp. 277-292). Batpatla, India: Sree Lakshmi Press.

Riesenberg, L. E. & Gor, C. O. (1989). Farmers' preferences for methods of receiving information on new or innovative farming practices. Journal of Agricultural Education, 30(3), 7-13.

Rogers, E. M. & Shoemaker, F. F. (1971). Communication of innovations: A cross-cultural approach. New York: The Free Press.

Rogers, E. M. (1962). Diffusion of innovations. New York: The Free Press.

Webster's New World Dictionary of the American Language. (1986). New York: Prentice Hall.

THE EFFICACY OF THE ADOPTION DIFFUSION THEORY FOR AGRICULTURAL EDUCATION

A Critique

Glen C. Shinn, Texas A&M University, Discussant

This is an important area of concern for those who work at the interface of human performance and agricultural technology. The theories of innovation and adoption are central to the missions of agricultural education.

The paper was very well written and followed a logical progression. It provided an excellent review of the theoretical framework of the problem. The theories were presented clearly and are well accepted. Practitioners should keep the paper as a periodic review of literature of adoption diffusion theory.

The research methods were clear and appropriate. Certainly, the telephone survey of 200 farm operators was an ambitious project. The instrumentation was clear and appeared to be both valid and reliable.

The findings were very interesting and provided insight into the innovativeness of 183 Pennsylvania farm operators. Were there differences between farm operators who were and were not land owners? The techniques used to classify respondents were very good. The variables identified in the two models will be very useful for programming and management decisions. There is an error in the narrative of table 3, which reported the classification of innovators rather than early adopters.

With scarce resources, it is essential to focus programming to optimize our influence. The implications are challenging and deserve more discussion.

However, the last line of the paper was very disconcerting --- does it really take 22 years for us to adopt the theories of adoption and diffusion developed by Rogers, Shoemaker and Lionberger?

THE APPLICATION OF EXPLORATORY FACTOR ANALYSIS IN AGRICULTURAL EDUCATION RESEARCH

Matt R. Raven
Adjunct Assistant Professor
Department of Agricultural and Technology Education

Introduction

Factor analysis is not a new method of data analysis. It has been used extensively as a data analytic technique for the better part of the 20th century (Spearman, 1904). Social scientists have used it extensively for examining patterns of interrelationships, data reduction, instrument development, classification and description of data, data transformation, hypothesis testing, exploring relationships in new domains of interest, and mapping construct space (Rummel, 1970). Factor analysis provides a geometrical representation that allows for a visual portrayal of behavioral relationships, a very common research objective in agricultural education.

Factor analysis is a proven analytical technique that has been studied extensively by statisticians, mathematicians, and research methodologists. Rummel (1970) suggested that there have been more methodology books devoted to the topic of factor analysis than any other social science method or technique. Similarly, more space has been dedicated to factor analysis in the journal Psychometrika than to any other quantitative subject in the behavioral sciences (Nunnally, 1978).

The fact that factor analysis can be so generally applied in the social sciences may help explain the large amount of information that has been published regarding this technique. Yet, despite the copious amount of literature concerning how to utilize factor analysis in social science research, very few evaluations of how factor analysis has been applied in empirical work have been conducted. A study by Ford, MacCallum, and Tait (1986), in which they reviewed and evaluated factor analytic practices in applied psychological research, is one of the few assessments of the application of factor analysis in the behavioral sciences. Similar evaluations are lacking in other areas of the behavioral sciences and are non-existent in agricultural education research. Are agricultural educators utilizing this powerful and flexible analytic technique in their studies? If agricultural educators are using factor analysis, are they applying the technique correctly? How should factor analysis be applied in empirical studies and how should it be reported?

Theoretical Framework

When conducting a factor analytic study a number of issues must be considered. Ford et al. (1986) concentrated on four major issues which included: (1) the choice of factor model to be used, (2) the decision about the number of factors to retain, (3) the methods of rotation, and (4) the interpretation of the factor solution. Results of a factor analysis and interpretation of the results can be severely influenced by decisions made at each step of a factor analysis (Comrey, 1978; MacCallum, 1983; Weiss, 1976). Weiss (1976) commented that researchers must provide a rationale for each decision, and interpret results in agreement with those decisions.

Factor Model

The researcher must first choose which factor model to employ in the analysis. Factor analysis can be divided into two different approaches: common factor analysis and components analysis (Ford et al., 1986). The component analysis model involves no assumption about unique or error variance in the data. However, the common factor analysis model assumes that the variance in a variable can be divided into common and unique components, with the unique variance being further divided into specific and random error variance (Rummel, 1970).

Common factor analysis and components factor analysis both have supporters and critics. Tucker, Koopman, and Linn (1969) stressed that researchers should give serious thought to the appropriate factor model while designing the study. The components model is more appropriate when the objective is to maximize the ability to explain the variance of observed variables. However, common factor analysis is more appropriate when the measured variables are assumed to be a linear function of a set of latent variables (Ford et al., 1986; Tucker et al., 1969). Kenny (1979) argued that using components analysis when the objective is to determine relationships among latent variables can lead to inappropriate solutions which do not contribute to substantive theory.

Number of Factors

The number of factors that are retained prior to rotation have considerable influence on the outcome of a factor analysis (Ford et al., 1986). As with choosing a factor model, the researcher has a decision to make in regards to the criterion to be used for retention of factors. Unfortunately, various criterion rules used by researchers often lead to different solutions (Ford et al., 1986; Humphreys & Ilgen, 1969; Humphreys & Montanelli, 1974).

The Kaiser criterion of retaining factors with eigenvalues greater than one is often cited as the most appropriate for components analysis (Kim & Mueller, 1978; Weiss, 1976). However, Tucker et al. (1969) found in a study utilizing a known factor structure that the Kaiser criterion often incorrectly estimated the number of factors. The scree test and parallel analysis have the most support among alternative criteria (Ford et al. 1986). A recommended strategy is to use a number of decision rules and to examine a number of solutions prior to coming to a final conclusion on the number of factors to retain (Ford et al., 1986; Comrey, 1978; Harris, 1967).

Rotation

The rotation of factors is done in order to improve the meaningfulness, reliability, and reproducibility of factors (Ford et al., 1986; Weiss, 1976). The prime objective of rotation is to achieve simple structure (Thurstone, 1947). Simple structure is achieved by rotating factors around the origin until each factor is maximally co-linear with a distinct cluster of vectors (Rummel, 1970). Oblique rotation allows factors to be correlated, while orthogonal rotation generates factors that are statistically uncorrelated (Ford et al., 1986). Nunnally (1978) cited the simplicity, conceptual clarity, and ease of subsequent analysis as strengths of orthogonal rotation. Oblique rotation adds statistical complexity requiring greater user sophistication and care in interpretation (Ford et al., 1986). However, the added complexity of oblique rotation provides additional information in the form of factor intercorrelation. Harman (1976) argued it is because of these factor intercorrelations that oblique rotation more accurately portrays the complexity of the variables of interest as factors in the real world are rarely uncorrelated.

Interpretation

The ultimate goal in factor analysis is the identification of the underlying constructs (Ford et al., 1986). Interpretation is the process in which the researcher labels or gives meaning to the results of the factor analysis. Rules have been established to guide interpretation and reduce subjectivity. A commonly used rule specifies that only variables with loadings of .40 or higher on a factor should be considered (Ford et al., 1986). Ford et al. (1986) and Rummel (1970) argued that interpretation calls for an examination of high and low loadings, as well as sign, across variables.

There are other issues besides the major issues discussed above which impact the quality of a factor analytic study. Large sample sizes are highly desirable in factor analysis (Browne, 1968). Ford et al. (1986) considered computer program package and reporting of factor analytic results as important issues affecting a factor analytic study. Rummel (1970) specified that published studies should contain the necessary information to allow for critical evaluation of the research, replication, and advancement of knowledge. Ford et al. (1986) argued that published results should include the factor model, method of estimating communalities (if applicable), method of factor retention, rotational method, strategy of interpreting factors, eigenvalues of all factors, percentage of variance accounted for, complete factor loading matrix, correlation matrix and descriptive statistics, computer program package, and pattern matrix and interfactor correlations (when oblique rotation is used).

Purpose and Objectives

The use of factor analysis and researchers' application of the technique have rarely been studied. In addition to the study by Ford et al. (1986), there was a study by Glass and Taylor (1966) that examined the use of factor analysis in education. However, there has not been a study that evaluated the use of factor analysis in agricultural education. Therefore, the purpose of this study is to assess and evaluate current factor analysis practices in agricultural education research. The following research questions were used to guide this study:

1. To what extent have agricultural education researchers used factor analysis during the past five years?

2. What decisions were made by agricultural education researchers relevant to the factor model, number of factors, rotation, and interpretation?

3. What results did agricultural education researchers present in published factor analytical studies?

Procedures

The two major refereed research publications in agricultural education, the Journal of Agricultural Education (JAE) and The Proceedings of the National Agricultural Education Research Meeting (NAERM) were examined for studies that used factor analysis as an exploratory analytical technique. Based on the methodology utilized by Ford et al. (1986), every article in the two publications was reviewed for a five-year period from 1988 to 1992 inclusive.

Studies that utilized factor analysis were coded according to factor model, factor retention, rotational method, and interpretation. Factor analysis studies were also coded for sample/variable ratio, statistical computer package, and presentation of the correlation matrix, communality estimates, eigenvalues, factor loadings, and percentage of variance accounted for by the factors.

Results

Use of Factor Analysis

A total of 402 articles were reviewed from Volumes 29 through 33 of JAE (N=176) and from Volumes 15 through 29 of NAERM (N=226) (Table 1). Of the 402 articles reviewed, 22 (5.5%) utilized factor analysis. There were 13 articles in NAERM and 9 articles in JAE which used factor analysis as a data analytic technique.

Table 1
Studies Published in the Journal of Agricultural Education (v. 29-33) and the Proceedings of the National Agricultural Education Research Meeting (v. 15-19) That Utilized Factor Analysis (N=402)

Data Analysis	Journal of Ag Ed		NAERM Proceedings		All Studies	
	f	%	f	%	f	%
Includes Factor Analysis	9	5.1	13	5.8	22	5.5
Does not include Factor Analysis	167	94.9	213	94.2	380	94.5
Total	176	100.0	226	100.0	402	100.0

Factor Analysis Decisions

Due to researchers' lack of reporting, it was not possible to determine which factor model was used in half (N=11) of the studies using factor analysis. The components model was the most popular one chosen (N=7, 32%) in the articles where it was possible to determine the model . Just four (18%) articles stated that the common factor model was used.

A majority of articles (N=14, 64%) also failed to provide enough information to determine the decision rule for the number of factors to be retained. Of the decision rules reported, the scree test (N=4, 18%) and some combination of tests (N=4, 18%) were the most popular.

Nearly half (N=10, 45%) of the articles did not report which rotational method was used. Orthogonal rotation was the rotation of choice (N=8, 36%) of the articles that did report rotational method. The majority of articles (N=15, 68%) did not present any rotated factor loadings.

Half of the articles (N=11) that used factor analysis did not present enough information to determine how the factor solution was interpreted and factors labeled. Nearly half of the articles (N=10, 45%) used a minimum value based of factor loading size as their strategy in interpreting factors.

Table 2

Summary of Decisions in the Application of Factor Analysis of Studies Published in the Journal of Agricultural Education (v. 29-33) and the Proceedings of the National Agricultural Education Research Meeting (v. 15-19)

	Journal of Ag Ed		NAERM Proceedings		All Studies	
Decision	f	%	f	%	f	%
Factor Model						
Common	1	11.1	3	23.1	4	18.2
Components	5	55.6	2	15.4	7	31.8
Not presented	3	33.3	8	61.5	11	50.0
Number of factors						
Eigenvalue >1.0	0	0.0	0	0.0	0	0.0
A priori	0	0.0	0	0.0	0	0.0
Best fit	0	0.0	0	0.0	0	0.0
Scree test	1	11.1	3	23.1	4	18.2
Combination	3	33.3	1	7.7	4	18.2
Not presented	5	55.6	9	69.2	14	63.6
Rotation						
Orthogonal	6	66.7	2	15.4	8	36.4
Oblique	1	11.1	3	23.1	4	18.2
Not presented	2	22.2	8	61.5	10	45.4
Interpretation						
Minimum value	4	44.4	6	46.2	10	45.4
High loadings	0	0.0	0	0.0	0	0.0
A priori	0	0.0	0	0.0	0	0.0
Other	1	11.2	0	0.0	1	4.6
Not presented	4	44.4	7	53.8	11	50.0

Published Results

The majority of articles (N=14, 64%) did not report the sample-to-variable ratio. Nearly half of the studies (N=10, 46%) presented the statistical package used with the majority citing SPSS (N=9, 41%) (see Table 3). Only two studies (9%) presented the correlation matrix used as input for the factor analysis. Only one study (4%) reported communalities. Just four studies (18%) reported eigenvalues. Nearly half of the studies (N=10, 45%) did report the variance accounted for by the retained factors. However, just four studies (18%) reported interfactor correlations.

Table 3
Summary of Information Presented in Factor Analytic Studies Published in the Journal of Agricultural Education (v. 29-33) and the Proceedings of the National Agricultural Education Research Meeting (v. 15-19)

Information	Journal of Ag Ed		NAERM Proceedings		All Studies	
	f	%	f	%	f	%
Sample/Variable Ratio						
>5:1	3	33.3	3	23.1	6	27.3
<5:1	2	22.2	0	0.0	2	9.1
Not presented	4	44.4	10	76.9	14	63.6
Statistical package						
SPSS	4	44.4	5	38.5	9	40.9
Other	1	11.2	1	7.7	1	4.6
Not presented	4	44.4	7	53.8	12	54.4
Factor scores						
Estimates	1	11.1	2	15.4	3	13.6
Composites	1	11.1	0	0.0	1	4.6
Indeterminant	2	22.2	2	15.4	4	18.2
Not computed	5	55.6	9	69.2	14	63.6
Presentation of Results						
Data Matrix YES	0	0.0	2	15.4	2	9.1
Communalities YES	0	0.0	1	7.7	1	4.6
Eigenvalues YES	1	11.1	3	23.1	4	18.2
Variance YES	5	55.6	5	38.5	10	45.4
Correlations YES	1	11.1	3	23.1	4	18.2
Factor Loadings						
None	5	55.6	10	76.9	15	68.2
Part	4	44.4	2	15.4	6	27.3
All	0	0.0	1	7.7	1	4.5

Conclusions

Despite factor analysis being a well-known, frequently used statistical technique in the social sciences and applicable for agricultural education, agricultural educators rarely use this analysis. During the past five years just over 5% of the studies in the two major research publications of agricultural education utilized factor analysis. Why aren't agricultural educators using this common, yet powerful analysis more often? Rummel (1970) argued that a communications gulf already exists between researchers who apply or understand factor analysis and those who do not. Perhaps the reason why agricultural educators do not utilize factor analysis more frequently is because of their lack of understanding of this analytic technique.

Results of this review indicate that agricultural educators lack a clear understanding of factor analysis as the technique is often poorly applied in agricultural education. A major concern is the lack of reporting concerning crucial decision issues in conducting a factor analysis. When decisions were reported they were often inappropriate. The components model was the most cited choice of factor model. However, since most of the studies were interested in relationships among unmeasured latent variables, researchers seem to be overdependent on the components model. Similarly, when choosing a rotational method the majority of researchers chose an orthogonal rotation to force independence among the factors without theoretical justification. Ford et al. (1986) suggested that since orthogonal rotation is a subset of oblique rotation, it makes more sense to do an oblique rotation and check to see if the factors are interdependent or dependent of each other. The use of an orthogonal rotation when the factors are interdependent will affect the conclusions drawn from the data (Dunham, 1976; Ford et al., 1986). Finally, the use of a minimum score is arbitrary and can result in a loading of .40 being considered significant and a loading of .39 being ignored in defining a factor. Reliance on a singular strategy, like minimum loadings, results in a reduction of information used for defining a factor (Ford et al., 1986).

Reporting practices of factor analytic studies are an area where agricultural educators need to improve. The majority of studies that utilized factor analysis failed to report the major decision issues in conducting a factor analysis. Additionally, when factor analytic procedures were stated they were often presented in a confusing manner. Only one study presented the information necessary for an informed review and replication of results. The presentation of factor analytic results such as a correlation matrix, eigenvalues, or communality estimates were almost always lacking. The lack of such results makes it impossible for reviewers to determine the appropriateness of using factor analysis.

Recommendations

Agriculture educators need to increase their understanding of factor analysis if it is to be used correctly. The basics of factor analysis should be taught in agricultural education graduate programs so new faculty feel comfortable using this technique. Additionally, factor analysis workshops should be taught at regional and national meetings so that current faculty that are unfamiliar with factor analysis can gain a basic understanding of the technique.

Agricultural educators that are currently using factor analysis need to follow recommendations found in the literature regarding technique and presentation of factor analysis results. Reviewers of agricultural education studies should be sure that the researcher describes the factor analysis methodology completely with accurate terminology. Additionally, researchers and reviewers should make sure that the factor model is related to the research objectives. Furthermore, oblique rotation should be used unless a theoretical case is made for an orthogonal rotation. Also, multiple solutions should be examined prior to the decision on factor retention and the resulting factors should be interpreted based on the knowledge of the variables and an examination of all factor loadings.

Researchers, reviewers, and editors of agricultural education research publication should also be sure that studies that utilize factor analysis present the procedures clearly and in enough detail for informed review, replication, and cumulation of knowledge. Given the limitations of space in agricultural education research publications not every piece information concerning a factor analysis can be presented. However, every researcher using factor analysis should at the minimum report the decisions made regarding the major issues in conducting a factor analysis. A better understanding of factor analysis among agricultural educators and better methodology when using factor analysis will improve agricultural education research.

References

Browne, M. W. (1968). A comparison of factor analytic techniques. Psychometrika, 33(3), 267-334.

Comrey, A. L. (1978). Common methodological problems in factor analytic studies. Journal of Consulting and Clinical Psychology, 46(4), 648-659.

Dunham, R. B. (1976). The measurement and dimensionality of job characteristics. Journal of Applied Psychology, 61(4), 404-409.

Ford, J. K., MacCallum, R. C., & Tait, M. (1986). The application of exploratory factor analysis in applied psychology: A critical review and analysis. Personnel Psychology, 39(2), 291-314.

Glass, G. V. & Taylor, P. A. (1966). Factor analytic methodology. Review of Educational Research, 36(5), 566-587.

Harman, H. H. (1976). Modern factor analysis. Chicago, IL: University of Chicago Press.

Harris, C. S. (1967). On factors and factor scores. Psychometrika, 32(4), 363-379.

Humphreys, L. G. & Ilgen, D. R. (1969). Note on a criterion for the number of common factors. Educational and Psychological Measurement, 29(3), 571-578.

Humphreys, L. G. & Montanelli, R. G. (1974). An investigation of the parallel analysis criterion for determining the number of common factors. Multivariate Behavioral Research, 10(2), 193-205.

Kenny, D. A. (1970). Correlation and causality. New York: Wiley.

Kim, J. O. & Mueller, C. W. (1978). Factor analysis: Statistical methods and practical issues (Sage University Paper Series on Quantitative Applications in the Social Sciences). Beverly Hills, CA, and London, England: Sage Publications.

MacCallum, R. C. (1983). A comparison of factor analysis programs in SPSS, BMDP, and SAS. Psychometrika, 48(2), 223-231.

Nunnally, J. C. (1978). Psychometric theory (2nd ed.). New York: McGraw-Hill.

Rummel, R. J. (1970). Applied factor analysis. Evanston, IL: Northwestern University Press.

Spearman, C. (1904). General intelligence, objectively determined and measured. American Journal of Psychology, 15, 201-293.

Thurstone, L. L. (1947). Multiple-factor analysis. Chicago, IL: University of Chicago Press.

Tucker, L. R., Koopman, R. F., & Linn, R. L. (1969). Evaluation of factor analytic research procedures by means of correlation matrices. Psychometrika, 34(4), 421-459.

Weiss, D. (1976). Multivariate procedures. In Dunnette, M. D. (Ed.), Handbook of industrial/organizational psychology. Chicago, IL: Rand McNally.

THE APPLICATION OF EXPLORATORY FACTOR ANALYSIS IN AGRICULTURAL EDUCATION RESEARCH

A Critique

Glen C. Shinn, Texas A&M University, Discussant

This paper combines a practical handbook on the uses of factor analysis coupled with the examination of current applications of the research tool in recent agricultural education journals. The inquiry into the use and misuse of factor analysis in agricultural education research is important but must be subsumed by the nature of the research problem.

The purpose and objectives of the research were appropriate. The procedures were clear and the results were straightforward and sequential. The concern that only 22 of the 402 articles which were published used factor analysis may also speak to the type of research conducted by the profession.

The paper includes a convenient checklist for other researchers. The discussion surrounding the major issues of factor analysis was helpful and promotes a practical understanding of the use of factor analysis.

The conclusions were warranted; there is evidence that we are much more likely to use tools when we feel comfortable with them. Too, the skills are improved when the features of the tool are well understood.

The recommendation for a pre-session workshop was well founded. This paper should provide a useful reference as we search for proper analytical tools for future research.

NAERM Fourth Session
1:30-3:00 p.m.
Concurrent Session I

Theme: Agricultural Education Programs: Secondary and Postsecondary

Topic 1: Education and beyond experiences of postsecondary vocational-technical education program participants based upon selected characteristics

Speakers: M. Susie Whittington, Lou Riesenberg (University of Idaho)

Topic 2: Longitudinal study of undergraduate agriculture majors: 1977, 1982, 1987 and 1992

Speakers: Walter Taylor, Donald Johnson (Mississippi State University)

Topic 3: A quantitative guide to assess institutional excellence in vocational education

Speakers: George Wardlow (University of Arkansas)
Richard Joerger (University of Wisconsin-Madison)

Topic 4: An evaluation of the secondary agricultural education summer programs as viewed by Idaho public school administrators

Speakers: John Mundt (University of Idaho)
Jack Blattner (Meridian [ID] High School)

Discussant: Kerry Odell (West Virginia University)

Chairperson: Samuel Curtis (The Pennsylvania State University)

Facilitator: Steve Harbstreit (Kansas State University)

EDUCATION AND BEYOND EXPERIENCES OF POSTSECONDARY VOCATIONAL-TECHNICAL EDUCATION PROGRAM PARTICIPANTS BASED UPON SELECTED CHARACTERISTICS

M. Susie Whittington
Assistant Professor
Agricultural and Extension Education
University of Idaho

Lou E. Riesenberg
Professor
Agricultural and Extension Education
University of Idaho

Introduction

The year 1992 marked the seventy-fifth anniversary of the Smith-Hughes Act which first established federal funding for vocational education. Since passage of the Smith-Hughes Act, vocational education has experienced changes in skills, occupations, teacher requirements and competencies, educational and work environments, and student characteristics (Wallrodt, cited in David, Hjelm, & Harris, 1983). However, the fundamental goal of vocational education, most widely accepted by vocational education advocates, has not changed--preparing people to enter into and remain in gainful employment:

> Those who, in 1917, spoke for vocational education maintained that the schools had an obligation to serve those who moved from the high school into the world of work, as well as those who moved on to college, and that vocational education should therefore be provided... (Leighbody, 1972, p. 5).

According to Brown and Choy (1988), "Students are consumers of vocational education. When they choose a vocational program, they purchase skills, knowledge, a credential, and access to future employment opportunities" (p. 1).

Are vocational education students gaining access to future employment opportunities? Are they preparing for and entering into gainful employment? Stenberg and Riesenberg (1991) in a follow-up study of Idaho secondary students found that five years after high school graduation, vocational concentrators were more likely to be employed in jobs related to their vocational training (p. 9).

Secondary vocational programs, however, are not the only programs in question. What are students receiving from their postsecondary vocational-technical programs? Can postsecondary graduates, five years after graduation, report that they are employed in jobs related to their vocational education?

"In vocational education, as in other areas of education, assessment of performance outcomes is increasingly viewed as a way to measure program quality and to motivate program improvement" (U.S. Department of Education, 1991, p. i). Leighbody (1972) wrote, "Nearly every aspect of vocational education needs to be critically examined and, through research, either validated or changed, and this must be a continuing process" (p. 106).

Purpose

Idaho's postsecondary vocational-technical institutions and the Idaho State Division of Vocational Education contracted with the Department of Agricultural and Extension Education at the University of Idaho to conduct a statewide follow-up study of 1987-1988 postsecondary vocational-technical program participants.

This study was conducted to assess the effectiveness of Idaho's postsecondary vocational-technical programs as perceived by the participants of those postsecondary vocational-technical education programs. The specific research objectives guiding this study were:

1. Describe the postsecondary vocational-technical participants (completers and leavers) on selected demographic and situational characteristics.

2. Describe the employment history and status of the postsecondary vocational-technical participants since their participation in the educational programs.

3. Identify differences between the postsecondary vocational-technical participants based upon completer/leaver status, general postsecondary program area, gender, and GPA.

Procedures

The target population for this study was all 1987-1988 Idaho postsecondary vocational-technical education program participants at the six Idaho postsecondary vocational-technical institutions **(2275 participants)**. Transcripts of the participants were collected through the postsecondary vocational-technical institutions. After two mailings to validate and update addresses supplied by the institutions, a total of 1641 participants were identified as the accessible population.

The Idaho Student Follow-up questionnaire (ISF) was designed to allow participants to assess the effectiveness and outcomes of their postsecondary vocational-technical education. The instrument was validated by a panel of experts. A pilot test of the 36-item questionnaire was conducted using 15 students enrolled at one of the postsecondary vocational-technical institutions; the students were not subjects in the study. The Cronbach's Alpha reliability coefficient for "selected aspects of Postsecondary education" was 0.85. After using Dillman's Total Design Method and four mailings, the response rate to the ISF was 48.4% of the accessible subjects.

In order to determine the effects of nonaccessibility (NACC) of addresses and the nonresponse (NR) to the ISF questionnaire, attempts were made to relate (model) NACC and NR to variables that were known for all the sampling units, such as gender, GPA, age, total credits earned, institution attended, educational program completed and completer/leaver status obtained from the student transcript files. All significant variables found were used to adjust the response variables to accommodate the NACC and NR sampling units.

With the apparent (and significant) relationship between accessibility and response rate to the selected transcript variables, adjustments were made to the response variables in the study using the selected transcript variables as covariates for nonaccessibility and nonresponse of sampling units.

The adjustments were made by use of logistic regression to predict the accessibility and response probabilities for the individuals who responded to the survey and then weighing the individuals who were not included proportionally. Let p be the probability of a randomly selected student being accessible, and r be the probability of that individual responding to the questionnaire, given that he/she is accessible. The logistic regression related p and r to the significant covariates chosen via a logit response variant. Finally, the weight for the individual was calculated proportional to the estimate of p times the estimate of r.

The differences between the actual and adjusted response estimates of the ISF variables reported in this study were statistically non-significant. Therefore, the effects of nonaccessibility of addresses and the nonresponse to the ISF questionnaire were considered to be appropriately and adequately addressed.

Findings

The average age of participants, during 1988, was 28.5 years, with a range of 18 to 77. The respondents of this study participated in postsecondary vocational-technical programs in 10 areas with the greatest percentage participating in Mechanical Trades (21%) and Business and Office (21%). The smallest percentage of respondents (4%) participated in Agriculture programs.

The ten program areas were found to be highly gender associated (see Table 1). The program area with the highest number of male enrollees (439, Mechanical Trades) showed a female enrollment of 11. The program area with the highest female enrollment (284, Business and Office Occupations) reflected 36 males enrolled.

Table 1

Distribution of 1987-1988 Postsecondary Vocational-Technical Education Program Completers by Program Area and Gender

	Gender	
Program Area	Male	Female
Business and office occupations	36	284
Health related	5	189
Electronics	163	1
Mechanical trades	439	11
Electrical trades	92	2
Communications	70	22
Construction and manufacturing	110	24
Service industry	131	79
Marketing	58	70
Agriculture	14	14

Nearly 60% of the participants in this study were males. Nearly 93% of participants were Caucasian; the other 7% were Native American, Hispanic, Black, Asian, or of other ethnic origin.

One-half (50%) of the subjects in this study reported their highest level of education attained was a postsecondary certificate. An additional 25% of the participants had received a postsecondary degree while 5% reported receiving an Associate of Arts degree. Sixteen percent of the participants reported completing some college requirements while 5% reported receiving a Bachelor of Science degree. Slightly less than 20% of the participants did not complete the prescribed course of study and left the program before completion (leavers).

Thirty-three percent of the postsecondary vocational-technical education program completers fathers' highest level of education was a high school diploma. Over one-fourth (28%) of the participants reported their father had not attained a high school diploma. Seventeen percent reported their father had received a college degree. Just over 40% reported that their mother's highest level of education was a high school diploma. Nineteen percent of the participants reported their mother had attained less than a high school diploma. Thirteen percent reported their mother had received a college degree.

Almost 90% of the postsecondary vocational-technical participants reported they were *satisfied to very satisfied* with their choice of postsecondary vocational-technical **institution**.

Four percent indicated they were *very dissatisfied* with their choice of postsecondary vocational-technical **institution**.

Almost 85% of the respondents indicated they were *satisfied to very satisfied* with their choice of postsecondary vocational-technical education **program**. Less than 5% of the respondents indicated they were *very dissatisfied* with their choice of postsecondary vocational-technical education **program**.

The respondents rated the teaching and instruction, and the classes and courses aspects of their postsecondary vocational-technical education experiences higher than the school's career guidance services, the school's student support services, or the admission and registration processes (Table 2).

Table 2

Rating of Selected Aspects of Their Postsecondary Vocational-Technical Education Program by 1987-1988 Postsecondary Vocational-Technical Respondents

	Frequency (Percent)				
Selected aspects	Excellent	Good	Fair	Poor	Mean Response *
The teaching and instruction	279	373	96	34	1.853
	35.1	46.9	12.1	4.3	
The classes and courses	222	430	113	15	1.899
	27.9	54.1	14.2	1.9	
The admission and registration processes	90	413	211	64	2.320
	11.3	51.9	26.5	8.2	
The school's career guidance services	100	296	270	98	2.479
	12.6	37.2	34.0	12.3	
The school's student support services	86	301	284	80	2.477
	10.8	37.9	35.7	10.1	

* Excellent = 1, Good = 2, Fair = 3 and Poor = 4.

When both the satisfaction with choices of institution and programs, and the ratings of selected aspects of the postsecondary vocational-technical programs responses were compared by institutions, general program areas, gender, cumulative GPA and whether or not the respondents had completed their educational program, some small statistically significant differences were found; but, the differences yielded no practical or applicable information.

Of the 690 participants who responded to the question, 60.3% indicated their current job was *quite to very related* to the job they had planned for while in their postsecondary vocational-technical program.

Respondents were overwhelmingly working in the same geographic area as the location of the postsecondary institution attended. About 18% of the respondents indicated their jobs were out-of-state.

Approximately 83% of the respondents were employed full-time or part-time, while 17% reported themselves as not employed (i.e., in the military, students, homemakers, seeking work or were not seeking work). Based on gender and completer/leaver status of the respondents, a lower percentage of females were employed full-time than males. A significantly larger percent of the leavers were either employed part-time or not employed than were the program completers.

For the respondents employed full-time during the Fall of 1988, no appreciable difference in average salary ($15, 227) was found between those who had completed their program and those who had not completed. However, a significant difference was found between completers and leavers in the reported part-time average salaries--$12,063 and $9,312, respectively.

At the time the data for this study were collected (Spring 1992, almost four years after their postsecondary education) over 73% of the respondents reported either self-employment (7%) or full-time employment; 5.7% were employed part-time and 20.5% reported themselves as other than employed. Of the 20.5% who were "other than employed," 5.5% indicated they were looking for work. A higher percentage of the female respondents indicated they were employed part-time or not in the labor force than did the male respondents. Also, a higher percentage of the program completers were self-employed or employed full-time than were those respondents who had not completed their postsecondary education.

Seven percent of the postsecondary vocational-technical respondents were self-employed in 1992; 9% of the males and 4% of the females. Of the self-employed respondents, 67.3% were program completers and 32.7% had not completed their postsecondary vocational-technical education program. The largest number of self-employed respondents had participated in agriculture, 17; mechanical trades, 10; and electrical trades, 7.

The 1990 average salary of the full-time employed respondents increased from 1988 by $5220 for males and $6194 for females. When contrasted by gender and program area (see Table 3), it should be noted that enrollment in a specific program area was highly gender associated, thus frequencies of males and/or females in certain program areas were not adequate for gender comparisons of salaries. Therefore, if the frequency was below five, the number was omitted from Table 3.

Participants rated safety conditions, co-workers and the variety of work tasks as *good to excellent* on a scale of *excellent, good, fair, or poor*. Potential for advancement was rated the lowest of all the job characteristics.

The ratings of the different job characteristics by one respondent were combined into an average job rating for each individual respondent. No significant difference in the average job ratings were found between female and male respondents. Completers rated their jobs higher than did the leavers--2.08 and 2.30, respectively. When the average job ratings were compared between the respondents of the various postsecondary vocational-technical education program areas, no significant deviation from the overall mean of 2.1022 *(excellent = 1, good = 2, fair = 3 and poor = 4)* was found.

The 795 participants responding reported that 29.4% had worked for one employer, 23.8% for two employers, 17.2% for three employers since their postsecondary vocational-technical education. The average number of different employers was 2.3.

Table 3
The 1990 Average Salary of 1987-1988 Postsecondary Vocational-Technical Education Program Completers Employed on a Full-time Basis by General Education Program Area and Gender

	Average 1990 Salary (Frequency)	
General Education Program Area	Male	Female
Business and office occupations	$22,681 11	$14,000 84
Health related	-- --	17,040 49
Electronics	28,591 60	-- --
Mechanical trades	20,887 120	-- --
Electrical trades	24,854 24	-- --
Communications	20,863 22	18,666 6
Construction and manufacturing	30,750 36	32,785 7
Service industry	21,954 33	15,714 14
Marketing	21,821 14	14,600 15
Agriculture	-- --	-- --

Conclusions

Based on the findings of the study the following conclusions were drawn:

1. Participants of vocational-technical education were pleased with their postsecondary education. When participants were asked if they were satisfied with their institution and program, 90% were satisfied to very satisfied with their choice of institution and 85% were satisfied to very satisfied with their choice of program.

2. Participants of vocational-technical education sought and found employment in-state; specifically within the service area of the postsecondary institution. However, they tended not to be self-employed.

3. Females and program leavers tended to be less than full-time employed and received lower salaries.

4. Eighty percent of participants completed the prescribed course of study resulting in certificates or AAS degrees. However, a large contingency of students either left their education prior to completion or did not use their education after completion.

5. Approximately 83% of the students became employed full-time or part-time immediately after completing their program of study. Student completers with a certificate or AAS degree were even more likely to be employed full time.

6. Part-time work completers earned significantly more than part-time work leavers.

7. Seventy-three percent of the students were working full-time or were self employed four years after program completion. Only 5.5% reported that they were looking for work.

8. The average salary of full-time employed students two years after completion of a certificate or AAS degree was $21,122. Students who completed the certificate or AAS degree found their salaries increased $5,404 over a 2-year period.

[illegible] initial salaries of completers and non-completers were about the same, however, the salaries of the completers increased almost twice as fast over a 2-year period.

10. Agriculture, more than the other vocational program areas, may be teaching gender issue awareness at the secondary level according to the gender association by program area data.

Implications

Based on the findings and conclusions of this study, the following implications were identified:

1. Postsecondary institutions should continue to deliver quality courses, classes, and instruction.

2. Efforts should be increased to retain students to completion, thereby increasing the percentage of students employed full-time and increasing salaries.

3. Students and instructors should be involved in gender equity awareness and implementation programs.

4. Further research needs to be conducted to determine reasons that leavers exit the program prior to completion.

References Utilized

Brown, C. L. & Choy S. P. (1988). Information Disclosure in Postsecondary Vocational Education: Possibilities and Practices. Revised. Berkeley, CA: MRP Associates.

David, H., Hjelm, H. F. & Harris, R. C. (Eds.). (1983). Vocational Education Research in the 1980s. American Vocational Education Research Association in cooperation with the Coordinating Committee on Research in Vocational Education.

Leighbody, G. B. (1972). Vocational Education in America's Schools. Chicago: American Technical Society.

Palmer, J. (1984, September). Assessing the employment experience of community college vocational program graduates: a review of institutional follow-up studies. Graduate seminar paper, Los Angeles, CA: University of California at Los Angeles.

Stenberg, L. A. & Riesenberg, L. E. (1991, December). Distinguishing high school curriculum concentrators on high school academics and graduates' status five years later. Report of Research to the American Vocational Education Research Association Meeting in Los Angeles, CA.

U.S. Department of Education. (1991). State-Level Measurement of Performance Outcomes in Postsecondary Vocational Education: Executive Summary. (USDE Publication No. ED/OPBE91-17). Washington, DC: U.S. Government Printing Office.

EDUCATION AND BEYOND EXPERIENCES OF POSTSECONDARY VOCATIONAL-TECHNICAL EDUCATION PROGRAM PARTICIPANTS BASED UPON SELECTED CHARACTERISTICS

A Critique

Kerry S. Odell, West Virginia University--Discussant

The educational reform movement has created dramatic changes in both the content and context of vocational education. Yet, the underlying goal remains the same--preparing people for gainful employment. This study focused on the effectiveness of Idaho's postsecondary vocational-technical education programs. The specific objectives were to: 1) describe the characteristics of postsecondary vocational-technical participants, 2) describe the employment history of these individuals since their participation, and 3) identify differences between the participants based upon completer/leaver status, area of study, gender, and GPA. These objectives are certainly meaningful and measurable, but it was not made clear how they related to the stated purpose of the study.

The researchers mailed a questionnaire to 1641 individuals who were participants in vocational-technical education programs during the 1987-1988 school year. The authors did a credible job statistically controlling a threat to the external validity of the study created by a low (48.4%) response rate. Why were questionnaires sent to the entire accessible population? Would the use of a random sample drawn from the accessible population coupled with adequate follow-up of nonrespondents have been easier and less costly?

The findings provide a good indication of the perceptions of participants toward selected aspects of their postsecondary programs and institutions. The findings also provide a plethora of information about the occupational and employment status of the former postsecondary program participants. However, it was not clear how these findings relate to the effectiveness of Idaho's postsecondary vocational-technical programs. The finding that participation in vocational-technical programs is gender bound was particularly important and meaningful.

Finally, the authors provided a number of conclusions and implications. This section could be strengthened with a stronger focus on what the findings mean and how they might be used to strengthen postsecondary vocational-technical programs in Idaho. The authors should be recognized for their efforts to conduct research on the postsecondary component of vocational-technical education, an area desperately in need of data which can be used to support programs and formulate future directions.

This study prompted me to ask many questions, some of which might lead to future studies. Does vocational-technical education promulgate, perhaps unknowingly, gender biases? If so, how and why? What constitutes an adequate assessment of a vocational-technical programs value, worth or effectiveness? Why did almost a fifth of the participants leave programs (dropout) before completion (graduation)? Is determining the relatedness of employment necessary in assessing a programs effectiveness?

LONGITUDINAL STUDY OF UNDERGRADUATE AGRICULTURE MAJORS: 1977, 1982, 1987 AND 1992

Walter N. Taylor
Associate Professor
Ag Education & Experimental Statistics
Mississippi State University

Donald M. Johnson
Associate Professor
Agricultural and Extension Education
University of Arkansas

Introduction

American agriculture faces a potentially severe human capital shortage. Annually, there are approximately 48,000 new openings for food, agriculture, and natural resource graduates; however, only slightly more than 43,500 qualified graduates are available to fill these positions (Coulter, Goecker, & Stanton, 1990). Thus, the demand for graduates with expertise in the agricultural sciences is predicted to exceed the supply by about 11% through 1995.

Data collected from colleges of agriculture which are members of the National Association of State Universities and Land Grant Colleges (NASULGC) indicated a 28% enrollment decline from 1980 to 1989 (Litzenberger et al., 1991). Pescatore and Harter-Dennis (1987) attributed the decline to two factors: a decline in the college-age population and the failure of agriculture to compete with other professions in attracting students.

Much research has been done in search of ways to more efficiently and effectively recruit students. The focus of much of this research has been to identify characteristics of students pursuing majors in agriculture and determine factors or individuals which influence choice of major. Recruitment strategies are then developed to capitalize on the identified characteristics and factors.

Studies by Taylor (1989), Slocombe (1986), Bowen and Lee (1984) and Dunkleberger et al. (1982) found that family members, especially parents, had the most influence on choice of major. Slocombe (1986) found that recruitment literature, friends, university students, campus visitation and the high school agriculture teacher influenced the decision to enroll in the college of agriculture and that extension personnel, university literature, friends and campus visitation influenced choice of major.

An initial profile of undergraduate students enrolled in agriculture majors at Mississippi State University (MSU) was compiled in 1977 using data extracted from the 1977 USDA/CSRS regional project, S-114 (Parent, 1979). Bowen and Lee replicated the study in 1982 using only MSU students enrolled in agriculture majors and Taylor replicated the study in 1987. Data collected in each replication were compared to identify trends that may have developed for college of agriculture majors during the 10 year period since 1977.

Trends appeared to be developing in terms of an increase in the percentage of students from urban areas and those who enroll in high school agriculture courses. Parents of students in agriculture majors continued to have the most influence on their children regarding choice of major and students continued to select majors that will prepare them for careers and lead to desired lifestyles. Bowen and Lee (1984) and Taylor (1989) suggested that recruitment efforts focus on urban as well as rural area students and not be limited to those students enrolled in high school agriculture courses. It was also recommended that parents of prospective students be included in the recruitment process.

Purpose

The purpose of this study was to describe trends that may have developed over a 15 year period for college of agriculture majors. Objectives of the study were to: (1) describe the characteristics of undergraduate students enrolled in agriculture majors in the College of Agriculture and Home Economics at Mississippi State University in 1992; (2) compare the characteristics of students enrolled in the College of Agriculture and Home Economics at Mississippi State University in 1977, 1982 and 1987 to those students enrolled in 1992; and (3) identify enrollment trends that may have developed over a 15 year period.

Procedures

Design and instrumentation for this study were the same as those for the 1977, 1982 and 1987 studies. Data collection procedures were similar to those used in 1982 and 1987. A list of all undergraduates enrolled in the College of Agriculture and Home Economics in the Fall of 1992 was obtained. Sex of student, class, ACT score, high school grade point average (GPA), MSU GPA, cumulative GPA and transfer GPA were included on the list. A stratified random sample of 355 students was selected. Stratification was based on major. A faculty or staff contact for each major was identified and asked to deliver and collect the instruments from the student. After three weeks, contact persons were asked to encourage students who had not responded to do so as soon as possible. Additional students were randomly selected to replace those who could not be located or who were not enrolled in an on campus class. Contacts were able to deliver 295 of the 355 instruments.

A total of 170 responses were obtain from the assessable population for a response rate of 57.6%. Students who did not respond were compared on five variables: high school GPA, college GPA, classification, ACT scores and sex. No differences were found between the two groups on any of the variables.

Results

Mean student age for the four years showed a gradual increase from 20.9 years in 1977 to 21.0 in 1982 to 21.3 in 1987 to 23.2 in 1992. The percentage of females pursuing agriculture majors has remained relatively constant since 1982. The largest (5%) increase in the percentage of females pursuing agriculture majors took place from 1977 and 1982. There was a 2% increase in females between 1987 and 1992. Figures for all four samples are presented in Table 1.

Table 1
Gender of Agriculture Students in the College of Agriculture and Home Economics in 1977, 1982, 1987, and 1992

	1977		1982		1987		1992	
Gender	n	%	n	%	n	%	n	%
Male	106	80.9	175	76.4	145	78.4	130	76.5
Female	25	19.1	54	23.6	40	21.6	40	23.5
Total	131	100.0	229	100.0	185	100.0	170	100.0

Table 2 shows that the percentage of seniors comprising the four samples taken over the 15 year period has increased 18% between 1977 and 1992. Sophomores in the samples have steadily declined from 22% in 1977 to 12% in 1992. The percentage of juniors increased by 2 in the 1992 sample when compared to the sample taken in 1987. During the 10 year period from 1977 to 1987, samples showed a continuous decline in the percentage of juniors. After a 1% increase from 1977 and 1982, the percentage of freshmen has continued to drop. Freshman comprised 15% of the 1982 sample, 11% in 1987 and 7% in 1992.

Table 2
Classification of Agriculture Students in the College of Agriculture and Home Economics in 1977, 1982, 1987, and 1992

	1977		1982		1987		1992	
Class	n	%	n	%	n	%	n	%
Freshman	18	13.5	34	15.0	20	10.8	12	7.1
Sophomore	29	22.3	43	18.9	30	16.2	20	11.8
Junior	41	31.6	66	29.1	49	26.5	49	28.8
Senior	42	32.3	84	37.0	82	44.3	85	50.0
(Missing)	(1)	-	(2)	-	4)	-	(4)	-
Total	131	100.0	229	100.0	185	100.0	170	100.0

A notable decline was observed in the percentage of students in the 1992 sample from urban areas when compared to students in the 1977, 1982, and 1987 samples as shown in Table 3. While increasing from 38% in 1977 to 43% in 1982 and further to 55% in 1987, this figure dropped to 29% in 1992. Rural, non-farm students increased substantially from 14% in 1987 to 35% in 1992. This figure had declined slightly between 1977 and 1982 and substantially between 1982 and 1987. The percentage of students from farms has remained constant at about 30% since 1982. In 1977, 35% of the samples were from farms.

Married undergraduates pursuing agriculture majors remained virtually unchanged in the 1992 sample when compared to students in the 1987 sample. That figure had increased by 4% between 1982 and 1987 and decreased by 9% between 1977 and 1982.

Table 3
Residence Status of Agriculture Students in the College of Agriculture and Home Economics in 1977, 1982, 1987, and 1992

	1977		1982		1987		1992	
Residence	n	%	n	%	n	%	n	%
Urban (Towns >10,000)	51	37.6	98	42.8	101	54.5	58	29.3
Rural, Non-farm	35	27.2	59	25.8	26	14.1	60	35.3
Rural, Farm	44	35.2	72	31.4	57	30.8	51	30.0
(Missing)	(1)	-	-	-	(1)	-	(1)	-
Total	131	100.0	229	100.0	185	100.0	170	100.0

The percentage of students enrolled in agriculture majors who had graduated from a public high school rose by 18% between 1982 and 1992 with the greatest (15%) increase taking place between 1987 and 1992. Data in Table 4 also show that the percentage of students who graduated from private, non-religious high schools decreased 15% between 1987 and 1992.

Table 4
Type of High School Attended by Students Enrolled in the College of Agriculture and Home Economics in 1977, 1982, 1987, and 1992

Type of School	1977 n	1977 %	1982 n	1982 %	1987 n	1987 %	1992 n	1992 %
Public	88	68.2	130	57.0	111	60.0	128	75.3
Private, Religious	9	7.0	20	8.8	13	7.0	15	8.8
Private, Non-Religious	32	24.8	78	34.2	55	29.7	26	15.3
(Missing)	(2)	-	(1)	-	(6)	-	(1)	-
Total	131	100.0	229	100.0	185	100.0	170	100.0

For students in the 1992 study, 34% came directly to MSU after high school, 49% transferred from 2-year colleges and 16% transferred from 4-year colleges. Forty-three percent of the students in 1987 study had come directly to MSU and 42% transferred from 2-year colleges. In both 1977 and 1982, 49% of agriculture majors came directly to MSU after high school. Thirty-eight percent of the 1977 sample and 40% in the one in 1982 were transfers from 2-year colleges.

The data in Table 5 reveal that 74% of the undergraduate agriculture majors in the 1992 sample had not enrolled in agriculture courses while in high school. This is an increase of 4% when compared to the students in the 1987 study who had not taken high school agriculture courses. This figure had dropped during the 10 year period from 1977 to 1987. In 1977, 77% of the students had not taken high school agriculture, and 76% had not in 1982, and 70% had not in 1987. For agricultural education majors, the percentage of students who had taken agriculture in high school rose from 63% in 1987 to 78% in 1992. There was a decrease in this figure between 1982 when it was 65% and 1987.

Table 5
Students Enrolled in the College of Agriculture and Home Economics in 1977, 1982, 1987 and 1992 Who Took Vocational Agriculture Classes in High School

Agricultural Classes Taken	1977 n	1977 %	1982 n	1982 %	1987 n	1987 %	1992 n	1992 %
Yes	29	22.7	56	24.5	55	29.7	44	25.9
No	99	77.3	173	75.5	130	70.3	126	74.1
(Missing)	(3)	-	-	-	-	-	-	74.1
Total	131	100.0	229	100.0	185	100.0	170	100.0

Students in all four samples had a variety of work experiences. The data presented in Table 6 show that 49% of 1992 students sample had home farm work experience. This was a substantial decrease from each of the previous samples which had held relatively constant at 60%. Non-agricultural work experience had been obtained by large percentages of students in all four samples. Almost 90% of the students in both 1977 and 1982 had worked in non-agricultural jobs; however, this dropped to 78% in 1987, but rose slightly to 82% for students in the 1992 sample.

Table 6
Work Experience of College of Agriculture and Home Economics Students in 1977, 1982, 1987 and 1992

Work	1977		1982		1987		1992	
Experience	n	%	n	%	n	%	n	%
Home farm experience	75	61.5	141	66.8	109	58.9	84	49.4
Other farm employee	53	48.2	113	54.1	87	47.0	84	49.4
Other work experience	10	89.4	177	88.1	144	77.8	139	81.8

Fathers were, as with the previous three samples, rated by students in the 1992 sample as having the greatest influence on choice of college major and mothers were gain rated second. College teachers/advisors and college friends continued to be influential regarding choice of major. The ranking of these four individuals, as shown in Table 7, has remained the same since 1977.

Table 7
Individuals Influencing Choice of Major for College of Agriculture and Home Economics Students Included in 1977, 1982, and 1987 Samples

Individual	1977 (n=131)			1982 (n=229)			1987 (n=185)			1992 (n=170)		
of Influence	$\bar{X}$	SD	Rank	$\bar{X}$	SD	Rank	$\bar{X}$	SD	Rank	$\bar{X}$	SD	Rank
Father	2.06	.79	1	2.11	.77	1	1.93	.77	1	1.95	.79	1
Mother	1.82	.67	2	1.87	.69	2	1.86	.69	2	1.85	.72	2
College teacher/ advisor	1.61	.79	3	1.50	.69	3	1.62	.72	3	1.76	.84	3
College friend	1.44	.62	4	1.47	.65	4	1.55	.71	4	1.62	.77	4
Brother	1.42	.63	5	1.37	.64	6	1.25	.53	11	1.33	.62	8
Veterinarian	1.37	.74	6	1.28	.61	8	1.28	.59	9	1.29	.63	10
H. S. friend	1.33	.63	7	1.32	.57	7	1.29	.55	8	1.42	.66	6
Former student	1.32	.63	8	1.43	.65	5	1.36	.61	6	1.49	.75	5
Sister	1.30	.52	9	1.24	.55	11	1.24	.51	12	1.28	.60	12
Other teacher/principal	1.26	.51	10	1.26	.51	9	1.30	.57	7	1.30	.58	9
H. S. counselor	1.21	.46	11	1.21	.49	13	1.51	.42	5	1.28	.59	12
Vo-Ag teacher	1.18	.53	12	1.25	.61	10	1.27	.57	10	1.35	.69	7
Extension agent	1.16	.43	13	1.22	.54	12	1.21	.49	13	1.19	.49	13

Rating Scale: 1=No Influence, 2=Some Influence, 3=Very Influential

Career preparation continued to be rated by students as the most important factor in choice of college major followed by desired lifestyle. A notable change occurred in the 1992 data in that high school counselor ranked sixth among the factors after being rated the least or nearly the least most important factor in choice of college major in the previous 3 samples. Table 8 contains the data on importance of factors to choice of college major.

Table 8
Importance of Selected Factors on Choice of Major by College of Agriculture and Home Economics Students in 1977, 1982, and 1987

Individual of Influence	1977 (n=131) $\bar{X}$	1977 SD	1977 Rank	1982 (n=229) $\bar{X}$	1982 SD	1982 Rank	1987 (n=185) $\bar{X}$	1987 SD	1987 Rank	1992 (n=170) $\bar{X}$	1992 SD	1992 Rank
Career preparation	2.66	.64	1	2.76	.49	1	2.60	.65	1	2.75	.54	1
Style of life	2.18	.84	2	2.13	.83	2	2.06	.85	2	2.11	.82	2
Prior ag experience	1.94	.86	3	1.90	.84	4	1.85	.86	5	1.89	.85	4
Good income	1.91	.74	4	1.77	.72	5	1.88	.71	4	1.84	.70	5
Help others	1.90	.77	5	1.95	.75	3	1.90	.79	3	2.00	.72	3
College courses	1.43	.72	6	1.37	.66	6	1.40	.69	6	1.43	.69	8
College teacher/advisor	1.34	.63	8	1.32	.58	8	1.29	.57	9	1.35	.63	10
Scholarships/financial aid	1.34	.67	8	1.31	.64	9	1.38	.67	7	1.47	.76	7
Family	1.31	.54	9	1.34	.56	7	1.32	.50	8	1.22	.50	13
Friends in major	1.26	.51	10	1.27	.52	12	1.28	.49	10	1.28	.55	12
Better grades	1.25	.51	11	1.28	.56	11	1.40	.65	6	1.36	.63	9
H. S. counselor	1.18	.46	12	1.16	.44	13	1.17	.45	11	1.71	.50	6
H. S. courses	1.17	.50	13	1.28	.60	11	1.28	.57	10	1.34	.63	11

Rating Scale: 1=No Importance, 2=Some Importance, 3=Very Important

Conclusions

1. Over the 15 year period from 1977 to 1992, enrollment trends in undergraduates majoring in agriculture at MSU developed regarding age, classification and previous attendance at 2-year colleges. Students are older, have a higher classification and are more likely to have transferred from 2-year colleges.

2. The percentage of students from urban areas majoring in agriculture is decreasing while the percentage of rural, non-farm students is growing. This is a reversal of the trend thought to be developing over previous five year study intervals.

3. An increasing percentage of students in agriculture majors are graduating from public school while a decreasing percentage are graduating from private, non- religious schools. This trend began between 1982 and 1987.

4. Parents of students in agriculture majors continue to have a strong influence on their children regarding choice of major.

5. Students continue to select majors that will prepare them for careers and lead to desired lifestyles.

Recommendations

1. The College of Agriculture and Home Economics at MSU needs to increase efforts to attract students just completing high school as well as continue to recruit students from community colleges.

2. Recruitment activities to increase enrollment of students from urban areas should be implemented being careful not to decrease the emphasis on recruiting rural students.

3. Private as well as public schools should be the focus of recruitment efforts by the College of Agriculture and Home Economics.

4. Efforts to recruit high school students to major in agriculture should focus on all students, not just those enrolled in high school agriculture programs.

5. Recruitment programs and campus visits should be structured to include the parents of prospective students.

6. Prospective students should be provided with accurate, up-to-date information concerning majors and the career opportunities available for graduates.

References

Bowen, B. E. & Lee, J. S. (1984). Educational and occupational aspirations of students in agriculture majors. The Journal of the American Association of Teacher Educators in Agriculture, 25(2), 23-29.

Coulter, K. J., Goecker, A. D., & Stanton, M. (1990). Employment opportunities for college graduates in the food and agricultural sciences: Agriculture, natural resources, and veterinary medicine. United States Department of Agriculture.

Dunkelberger, J. E., Molinar, J. J., Sollie, C. R., Lyson, T. A., Ohlendorf, G. W., & Coleman, A. L. (1982). Higher education in agriculture: Students at southern land-grant universities (Southern Cooperative Series Bulletin 270). Auburn University: Alabama Agricultural Experiment Station.

Litzenberg, K. K., Suter, D. A., & Whatley, S. S. (1991). Summary of fall 1990 enrollment in colleges of agriculture of NASULGC institutions. National Association of College Teachers of Agriculture Journal, 35(2), 4-14.

Parent, F. D. (1979). College of agriculture students in the South: A profile. Unpublished masters thesis, Mississippi State University.

Pescatore, A. J. & Harter-Dennis, J. M. (1987). An assessment of student recruitment activities by departments of poultry and/or animal sciences. National Association of College Teachers of Agriculture Journal, 31, 22-25.

Slocombe, J. W. (1986). Factors associated with enrollment in agricultural curricula at the land grant universities. National Association of Colleges and Teachers of Agriculture Journal, 30(4), 26-29.

Taylor, W. N. (1989). Longitudinal study of undergraduate agriculture majors: 1977, 1982, 1987. Starkville: Mississippi State University, Department of Agricultural and Extension Education.

AN EVALUATION OF THE SECONDARY AGRICULTURAL EDUCATION SUMMER PROGRAM AS VIEWED BY IDAHO PUBLIC SCHOOL ADMINISTRATORS

A Critique

Kerry S. Odell, West Virginia University--Discussant

The purpose of this study was to determine Idaho public school administrators' perceptions of the Agriculture Science and Technology summer program in Idaho. The specific objectives were to: 1) review research literature in an attempt to identify activities associated with the quality and accountability of summer programs, 2) determine the importance of selected summer activities as perceived by Idaho public school administrators, 3) determine the accomplishment of selected summer activities as perceived by the administrators, 4) identify the factors that administrators believed most limited accomplishment of summer activities, and 5) determine the value of summer programs as perceived by Idaho's public school administrators. In a time of heightened educational awareness and fiscal constraint, extended employment becomes an important issue. Only sound and essential educational practices and activities will survive as school administrators make difficult budgetary decisions. The need for this study then seems quite evident, although the theoretical framework presented in this paper was a bit weak.

A researcher designed survey instrument was sent to 152 superintendents and principals. A commendable 89.5% response rate was reported, yet no mention was made as to the external validity threat posed by the 10.5% of the population who did not respond. The authors reported the use of nonparametric statistical measures. What were they? Only percentages and means were reported. Nonparametric statistics are most often used in one of four situations: 1) the data do not meet the assumptions for a parametric test, 2) the data consists of ranks, 3) the question to be answered does not involve a parameter, or 4) quick results are needed. It is not clear to me which of these situations existed in this instance.

The findings of the study were clearly presented. The conclusions were consistent with the findings and formed the basis for the recommendations offered. The conclusions and recommendations section could be strengthened with greater focus on what the findings mean and how they might be used to strengthen the agricultural education summer programs in Idaho. Does perceived importance by administrators warrant continuation of an activity? Shouldn't sound educational theory and contextual relevance be the screen through which summer activities are sifted? Recommendation three, the importance of communications, would be hard to dispute, but the findings of this study do not support it in its stated form.

The fundamental question one must ask with research of this nature is-- are we measuring administrators' perceptions of summer programs or their perceptions of teachers? The fact that administrators cited the instructor's philosophy as a limiting factor so often would lead one to theorize this is the case. The authors speculated that survey participants may believe the quality of the program is mainly up to the instructor. I would argue that the program is a direct reflection of the instructor.

A QUANTITATIVE GUIDE TO ASSESS INSTITUTIONAL EXCELLENCE IN VOCATIONAL EDUCATION

George Wardlow
Associate Professor
Agricultural and Extension Education
University of Arkansas

Richard Joerger
Lecturer
Continuing and Vocational Education
University of Wisconsin--Madison

Introduction

Attention to excellence in education is most frequently focused toward programs, classrooms, and individual student performance. Research questions are often framed to study course content, methods of instruction and elements of delivery on the classroom level. Until recently, the broader context in which learning is nested was seldom researched. Little past study has been devoted toward the larger environments in which agricultural and other vocational programs are found--in this case, the institutions themselves.

James Lewis, in his book Achieving Excellence In Our Schools (1986), discussed what he calls hallmarks of excellence for schools. In these schools all school people help children to become something more than they ever hoped to be. Schools of excellence welcome new ideas and provide incentives and rewards to their personnel for developing innovations and programs to improve student outcomes. They have administrative leadership which creates an organizational culture and structure in which the talents of all the school people may flourish. The school boards avoid the details of the daily operations and trust the administrators. Schools of excellence have top administrators who accentuate the positive and convey a sense of future and vision to the community and school personnel. They back their commitments with dollars and give school people freedom to take risks, question long-standing principles and practices, and try new things. Each of these schools has "the courage to change things even when all is going well, ...to require its administrators to share power and authority with school people, ...to stick with its values during difficult times, ...to rely less on short-term results and more on long-term gain, and the courage to involve all school people at all levels of the organization to improve people and solve problems" (Lewis, 1986, p. xii).

Supported by the National Center for Research in Vocational Education (NCRVE) Wardlow, Swanson, and Migler (1992) implemented a naturalistic study to identify the key institutional level factors that contribute to excellence in a national pool of institutions offering exemplary vocational education programs. Their Institutional Excellence Project was based on the premise that the study of institutions in which exemplary vocational education programs exist might provide insights regarding the nature and importance of this environment. This insight should provide the basis to empower agricultural educators for programmatic improvement in agricultural education programs and the institutions in which they exist. The researchers sought to quantify the findings of their study through the development of an instrument which might serve as an institutional effectiveness assessment guide (IEAG).

Purpose and Objectives

This paper seeks to meet two major objectives. It describes the process used in the creation of a quantitative instrument from a qualitative study of the interpretive research paradigm. It also describes the development and testing of the instrument which may serve as a guide to assess institutional factors which underlie exemplary agricultural education programs, as well as other vocational education programs. It may serve as a guide for educational decision-makers who seek excellence in agricultural and vocational education programs in their institutions.

Procedures

The project employed both qualitative and quantitative research design components and procedures. The findings of the earlier interpretive study reported in Wardlow, Swanson and Migler (1992) and Wardlow, Swanson and Joerger (1992) served as the framework for the development of the instrument. In that study, approximately 25 "exemplary institutions" offering vocational education programs were identified by a two-step panel of national experts in vocational education and school effectiveness. These institutions served as a pool from which 14 institutions were selected to include comprehensive high schools, secondary vocational centers, postsecondary technical institutes/colleges, and community colleges. The researchers spent 3 to 12 person-days in each of the 14 "exemplary institutions" offering vocational education. They used observational and interview data to identify institutional factors which were found to contribute to excellence in education. The factors were then organized into themes and sub-themes representing related items. The study reported herein developed those items into quantitative assessment items and organized them within the original thematic areas. The process for the identification of the "exemplary institutions" included two panels of national experts in vocational education and was well documented in two refereed research monographs published by the NCRVE; it is not explained here due to space limitations.

An interpretive research design was used in the development of the instrument to enable the researchers to gain input and consensus from participants of the exemplary institutions regarding the institutional level factors which contribute to excellence in vocational education programs. The participants reviewed the instrument for clarity and accuracy as it was being developed. These procedures were needed to ensure shared understandings of the constructs under study among project staff and exemplary institution participants.

A quantitative research design was employed after the instrument was configured in draft form. The instrument then was pilot tested with students, administrators, teachers and advisory committee members of vocational education programs. A descriptive research procedure was used to describe the characteristics and responses of the normative populations which were used to determine the test statistics of the IEAG.

The populations that participated in completing the final draft copy of the IEAG were advisory committee members, students, instructors, and administrators of the 14 exemplary institutions offering vocational education which were previously identified by Wardlow, Swanson and Migler (1992). Ten vocational students, 10 instructors, 10 advisory committee members, and up to five administrators were randomly selected from each institution to form the samples of each population. (Some institutions had fewer than five administrators. In these cases all administrators were included.)

The data were collected by use of a draft of the Institutional Effectiveness Assessment Guide (IEAG) instrument. Two versions of the IEAG were developed. One was designed for administrators, instructors, and advisory committee personnel and another was designed for students. The student version was developed by omitting several items included on the administrator/instructor/advisory committee version for which the students were considered to have inadequate information or experience to respond.

The IEAG consists of six major thematic areas which contribute to institutional effectiveness. These six themes and their subthemes are:

1. school climate, which includes a physical and material (ecology) dimension, a people (milieu) dimension, a social system (school organization) dimension, and a culture (norms, beliefs and values) dimension;

2. administrator attributes, which includes dimensions of leadership style, setting high expectations, propensity to take risks, attributes of flexibility, and ability to create a vision and sense of mission for the institution;

3. instructor attributes, include a caring attitude, an acceptance of student diversity, ability to create a positive climate and hold high expectations, possession of a high level of professional competence, and propensity to remain in the job role;

4. student attributes include aspects of positive feelings toward their programs and related efforts to maintain high self standards;

5. the curriculum theme in effective programs is based on extensive use of advisory committees, includes high levels of faculty ownership, and develops in the students both technical knowledge and holistic, personal skills;

6. the institutional marketing/student organizations/support services theme indicates that each of these components is a vital service of the institution and/or educational program.

In instrument development it is accepted practice to use statistical tools such as factor analysis to group items and to determine the extent to which multiple items measure like constructs. In the naturalistic interpretive study which provided a basis for this report and the instrument, the individual factors associated with the larger construct under study were identified first and then the themes were developed from those through the research methodologies of the research paradigm employed. Therefore, the use of statistical tools to organize thematic areas would only have served to approximate fact as was previously determined.

The instrument in this study was developed directly from the findings of the NCRVE Institutional Excellence interpretive study. This helps to insure the quantitative research concept of validity of the findings from an interpretive perspective. Interpretive studies are, by their design and procedures, inherently valid. Thus, it is assumed that the instrument reported herein represents the findings of the earlier study and is, therefore, valid. From a positivistic research perspective, to properly address face and content validity for the items which represent the factors and themes of the earlier study associated with institutional effectiveness, the project researchers, staff members, and the designated representatives and administrators of the exemplary institutions reviewed the instrument and found it to be valid. To address the reliability of the instrument, both internal consistency and stability coefficients were established after the project data were analyzed.

It is assumed that the items within the guide adequately represented the findings of the initial NCRVE Institutional Excellence Project study that were common across each of the participant exemplary vocational education institutions. Many institutions had unique characteristics, or factors, that contributed to their institutional excellence. Since these characteristics were not common across all institutions, they were not included in the development of the institutional effectiveness assessment guide. It is assumed that the instrument adequately represents the common institutional factors which underlie exemplary agricultural education programs, since these programs must operate with other vocational programs and within the larger institution. It is further assumed that all interested exemplary institution participants who were associated with the study had ample opportunities to provide input and feedback for the development of the guide.

The two versions of the IEAG, along with instructions for administering it, were packaged and sent to the designated representative at each of the participating exemplary institutions. With the assistance of that contact person, the subjects were administered the respective instruments. Contact persons at each exemplary institution provided follow-up communications with participants, collected completed instruments, and returned a packet of completed IEAGs to the NCRVE staff. Follow-up letters were sent and phone calls made to the contact persons of exemplary institutions which didn't return their completed instruments on the indicated due date. The due dates for return of the IEAG's was extended for institutions which communicated such a need.

There were 80 student, 36 administrator, 87 instructor, and 61 advisory committee usable IEAG instruments returned from nine of the 14 (64.29%) institutions. These data were used to calculate the internal consistency of each form of the instrument via a Cronbach's Alpha. In order to calculate the coefficient of stability, a second set of the IEAG instruments was sent to the designated representatives at three of the institutions for re-administration to participants approximately two to three weeks after the first administration. There were 24 of 25 usable administrator, advisory committee member, and instructor IEAG's used for the test-retest analysis procedures. The student version was not tested for stability because it was essentially a shorter version of the administrator/instructor/advisory member version.

To obtain the data for the analyses, study participants completed either the student version or the administrator/instructor/advisory committee member version of the IEAG. Participants responded to each question by circling one of five possible responses: one for 'almost never,' two for 'occasionally,' three for 'usually,' four for 'almost always,' and zero for 'not observed.' Higher scores, therefore, indicate strong evidence of the presence of the factor or theme being assessed. For example, a higher score on the school climate theme indicates that the respondents perceived a greater presence of the constructs that constitute the theme.

Analysis of Data

The SPSS/PC+, Version 4.0 (Norusis/SPSS, Inc. 1990) computer software was used to analyze the data of the IEAG. As previously noted, the Cronbach's alpha was calculated as a measure of internal consistency for each of the themes and subthemes, as well as the overall instrument. Simple correlations between two administrations of the instrument (to the same group of individuals) were calculated to determine stability estimates for each of the theme areas as well as the overall instrument. A "weighted score" was determined for the overall instrument to provide a proportional representation of each theme area based on the numbers of items within each theme area.

Results

The coefficient of stability was determined through the test-retest procedure for the administrator/instructor/advisory committee version of the IEAG. This version was tested because it was complete, compared with the student version which omitted several items. The coefficients of stability for the administrator/instructor/advisory committee person IEAG are listed by theme area in Table 1. The theme area reliability estimates range from .79 to .93 with the overall weighted instrument reliability estimate equal to .84.

The coefficient of internal consistency, as measured by the Cronbach's Alpha, was determined for the entire IEAG, as well as for applicable themes and subthemes of the guide. Coefficients were determined for the student version of the IEAG as well as the administrator/instructor/advisory committee member version. The data in Table 1 indicate that the overall internal consistency coefficient of the student version of the IEAG was .92. The internal consistency coefficients for each of the themes and subthemes ranged from .22 (instructor stability) to .86 (student attributes).

The data indicate the overall internal consistency coefficient of the administrator/instructor/advisory committee member version of the IEAG was .97. The internal consistency coefficients for each of the themes and subthemes of this version ranged from .65 (administrator-high expectations) to .95 (student attributes).

Table 1
Coefficients of Internal Consistency and Coefficients of Stability for the IEAG

	Internal Consistency		Stability
Theme/Subtheme	Student Version	Instructor Version	Instructor Version
School Climate	.83	.92	.90
Ecology	.56	.74	
People	.60	.82	
School Organization	.60	.82	
Culture	.46	.73	
Administrator Attributes	--	.92	.93
Leadership	--	.82	
High Expectations	--	.65	
Risk-Taking	--	.72	
Flexibility	--	.71	
Instructor Attributes	.84	.92	.79
Caring Attitude	.62	.75	
Student Diversity	n/a	n/a	
Positive Climate	.45	.71	
Professional Competence	.69	.86	
Stability	.22	.72	
Student Attributes	.86	.95	.88
Curriculum Development Process	--	.89	.92
Advisory Committee	--	.88	
Ownership	--	.75	
Program Content	--	n/a	
Dual Curriculum	--	n/a	
Inst Mktng/VSO/Support	.77	.86	.92
Marketing	.61	.82	
VSO	.73	.86	
Support Services	.74	.68	
Instrument Overall	.92	.97	.82
Instrument Weighted			.84

n/a = not enough responses to establish.
-- = items omitted from student version.

Conclusions and Recommendations

The project reported herein built upon previous works which identified institutional level factors which underlie excellence in vocational education. It sought to develop and test an instrument which might serve as a guide for institutional decision makers who seek to improve their institutions.

As a result of the earlier interpretive efforts, a quantitative instrument was developed and field tested. The development process of this instrument, which was based on accepted procedures of interpretive research, insured that the instrument was valid. Since it was based on the attributes of exemplary institutions, it possesses both face and content validity. The instrument was subsequently tested for both internal consistency and stability, as two forms of reliability. Each of these processes determined that the instrument is reliable.

In interpreting the utility of the study for application by institutions, it may be useful to understand that the instrument was developed from the findings of exemplary institutions. This may be a limitation in its design. However, the underlying objective of the line of research which was foundational to the development of the instrument was that leaders and practitioners in agricultural and vocational education could learn by observing and analyzing the attributes of institutions which exhibited excellence in education.

Following are some recommendations resulting from this study:

1. Research in education has traditionally focused on specific factors in isolation of each other. Many of these factors are based on the classroom as the unit of research with little regard for their manifestation at the institutional level. Additionally, there is a paucity of research which explores the interactions among these factors. Further, little research of this nature has been done in agricultural or vocational education. The larger construct representing institutional level factors which contribute to excellence in education should be further investigated.

2. Studies should be conducted to determine the relationships between exemplary programs of agricultural education and other vocational education programs within schools, and with the exemplary status of the institutions in which they exist. What is the unique contribution of the institutional quality status to the quality of the agricultural education program?

3. The instrument should be field tested with a much larger and more heterogeneous population of institutions. Institutions which are not identified as "exemplary" but which aspire to that goal, as well as institutions which are neither exemplary nor aspire to be, should be included in a field test. Further, it should be tested in institutions which are more heterogeneous with regards to factors such as the socio-economic status, ethnicity, cultural considerations and gender mix of the constituent groups which they serve. It should be tested in educational programs and institutions which are not necessarily vocational in orientation.

4. The instrument should be tested for concurrent validity against other instruments which are available and which purport to measure constructs which are component themes of this instrument. For example, instruments exist which measure perceptions of classroom climate.

References

Lewis, J., Jr. (1986). Achieving excellence in our schools.... By taking lessons from America's best-run companies. Westbury, NY: Jake Willet.

Norusis, M./SPSS Inc. (1990). Statistical package for the social sciences: PC. Chicago, IL: SPSS, Inc.

Wardlow, G., Swanson, G. & Migler, J. (1992, January). Assessing the nature and operation of institutional excellence in vocational education. Berkeley: National Center for Research in Vocational Education, University of California at Berkeley.

Wardlow, G., Swanson, G. & Joerger, R. (1992, December). A guide to assess institutional excellence in vocational education. Berkeley: National Center for Research in Vocational Education, University of California at Berkeley.

LONGITUDINAL STUDY OF UNDERGRADUATE AGRICULTURE MAJORS: 1977, 1982, 198 AND 1992

A Critique

Kerry S. Odell, West Virginia University--Discussant

The researchers begin their paper with an adequate review of related literature and a convincing overview of the need for the study. Changes in American society have relegated education in agriculture to less than desirable status. As a result "American agriculture faces a potentially severe human capital shortage." The purpose of the study was to describe trends in the characteristics and enrollment of undergraduates in the College of Agriculture and Home Economics at Mississippi State University in 1977, 1982, 1987 and 1992. The objectives were to: 1) describe the characteristics of undergraduate students enrolled in agriculture majors in the College of Agriculture and Home Economics in 1992, 2) compare the characteristics of students in the College in 1977, 1982 and 1987, to those enrolled in 1992, and 3) identify enrollment trends that may have developed over a 15 year period.

The data collection procedures used were adequately described. A 57.6% response rate was reported for the 1992 sample and the nonrespondents were found not to be different from respondents on five known characteristics. The authors did not state whether they felt this finding warranted generalization of the results back to the population from which the sample was drawn. In terms of instrumentation one might ask: What other important or relevant information might have been collected? Would state of residence be of any significance in a study of this nature? How were the questions on the instrument determined? Was a panel of experts or some other procedure used to establish the validity of the instrument? Was the instrument subjected to some form of reliability analysis?

The results of this study indicated some trends in undergraduate enrollments at MSU. Although differences among the five year periods were described, the statistical significance of these differences was not determined. My understanding was that random samples were selected from the populations of students at each data collection point. This procedure implies that a statistical test would need to be employed to determine if the differences among these groups were statistically significant or just due to chance.

The conclusions presented were consistent with the results, although a discussion of the implications of the findings may have resulted in more meaningful and substantive recommendations. The recommendations offered regarding recruitment in urban areas and in private schools is meritorious, but not supported by the trends identified in this study. If more students are coming from rural, non-farm areas, isn't that where recruitment ought to focus? How can recruitment programs be structured to include parents, seeing that parents are such an important player in career planning? Providing prospective students with up-to-date information concerning majors and career opportunities is important, but I failed to determine how this study warranted such a recommendation.

AN EVALUATION OF THE SECONDARY AGRICULTURAL EDUCATION SUMMER PROGRAM AS VIEWED BY IDAHO PUBLIC SCHOOL ADMINISTRATORS

John P. Mundt
Associate Professor
Agricultural and Extension Education
University of Idaho

Jack W. Blattner
Secondary Agriculture Instructor
Meridian High School

Introduction

All of the instructors of Idaho high school agriculture programs have summer contracts. Few are a full 12 months but most extend at least 40 days. Secondary agriculture teachers are on the public payroll during most of the summer and accountability is becoming increasingly important. School administrators must account for their district's expenditures and often the expenditures for the agriculture summer program are questioned. Most administrators who are strong advocates for summer programs have instructors who have proven their value. Other administrators have questioned the importance of the summer program. They have witnessed agriculture instructors working short days, making few student contacts, and attending too many fairs, shows, and FFA activities. Some administrators may have formed negative perceptions of these summer programs. Many times, school administrators look at summer programs and compare them to time spent on organized learning situations. Administrators' beliefs may tend to be different from that of the agriculture instructor.

As stated by Burton (1989):

> Summer agriculture programs exist to fulfill the learning needs of students. As those needs are satisfied, the needs of teachers and school administrators can also be filled. The key to successful agricultural summer programs lies in dreaming a little, planning a lot, implementing, adapting, and promoting student learning activities, and focusing on students daily. (p. 22)

It has generally been accepted that the teaching of agriculture students is most important when the actual industry is in full production. As Harris (1980) stated, "In addition to teaching mechanics, animal and plant science, and horticulture, teaching students during the summer has long been high on the list of importance of teachers and administrators alike" (p. 12).

Briers (1983) stated:

> Agriculture does not stop when school lets out for the summer and the best teaching scenario should be based when the days are the longest and the plants are growing the fastest. If we do not use the unique nature of agriculture to justify summer employment, then how can we explain the uniqueness of the vocational agriculture teacher? (p. 4)

Hilton (1983) found when administrators were asked for the keys to a successful summer program in agricultural education:

> ...from the administrators viewpoint, it must be a vocational agriculture teacher committed to a high quality program of student involvement in SOE and FFA activities and a teacher able to communicate the significance of the SOE and FFA programs to the quality of a total vocational agriculture program. (p. 12)

Purpose and Objectives

The overall purpose of this study was to determine Idaho public school administrators' perceptions of the Agricultural Science and Technology summer programs in the state of Idaho. It attempted to assess administrators' attitudes towards the value, the important components, and the limiting factors associated with summer programs in secondary agriculture. In order to accomplish the purpose, the following research questions were identified:

1. From a review of the research literature, which instructor activities were most commonly used to describe the components of secondary agriculture summer programs and, when accomplished, were usually associated with quality and accountable secondary agriculture summer programs?

2. How important were the selected activities to a quality secondary agriculture summer program according to Idaho public school administrators?

3. To what extent were the selected activities accomplished in Idaho secondary agriculture summer programs according to Idaho public school administrators?

4. What factors most limited the accomplishment of the selected activities in Idaho secondary agriculture summer programs according to Idaho public school administrators?

5. How valuable were Idaho secondary agriculture summer programs to the overall program, the students, the school, and the community according to Idaho public school administrators?

Methods and Procedures

The study was descriptive using non-parametric statistical measurements. The procedures used in this study were designed to determine Idaho administrators' perceptions of the Agricultural Science and Technology summer programs in the state of Idaho.

The population consisted of 152 potential survey respondents. The population included one superintendent and one principal from each of the secondary high schools with an Agriculture Science and Technology program. School districts with a superintendent/principal considered the questions for the superintendent and the principal separately, even though they were the same person. Seventy-six superintendents and 76 principals constituted the population of the study. Eight school districts had a superintendent/principal.

The survey instrument was a researcher designed, self administered mail questionnaire. The survey instrument was field-tested by a panel of experts for content validity. Superintendents and principals of schools with secondary agriculture programs were asked three questions about selected activities of a summer program. The questions included administrators' perceptions of these activities as to their importance, the extent they were being accomplished, and what factors limited their accomplishments. Additionally, administrators were asked about their perceived value of the summer program to various entities within the community. The questionnaire used a variety of questions to determine the administrators' perceptions and opinions of the summer component. A Likert-type scale of 1 through 4 was used for the selected activities and value questions. A scale of "1" indicated responses of great importance, great extent, and very valuable. A scale of "4" indicated responses of not very important, not at all, and not very valuable.

Questionnaires, cover letters, and return envelopes were mailed to superintendents and high school principals with a secondary agriculture education program on November 24, 1992. A follow-up letter with an additional questionnaire was mailed on December 29, 1992, to all non-respondents. A telephone call was made to all non-respondents on January 11 and 12, 1993. A total of 68 principals and 68 superintendents completed and returned the questionnaire for a response rate of 89.5 percent. Collection of the data was determined sufficient and declared complete January 25, 1993.

Questionnaires were reviewed for missing data and coded for electronic entry after they were received. All returned questionnaires were accepted for use. Data were summarized using descriptive statistics.

The reliability coefficients (Cronbach's Alpha) for the three subsets of interrelated Likert-type items used in this study were: importance of selected summer program activities, 13 items, 0.8722; the extent of accomplishment of selected summer program activities, 13 items, 0.9215 and the value of summer programs, six items, 0.9530.

Findings

Research Question 1

For the purpose of the study, many activities of the summer program were combined and condensed from the various activities found in the review of literature (Camp & Kotrlik, 1985; Arrington, 1983; Cepica, 1979). The 14 activities used in the study were: maintain agriculture program facilities and equipment; participate in the Vocational Education Summer Conference; participate in professional improvement classes and activities; plan and conduct FFA activities; update agriculture program curriculum and teaching materials; participate in fair activities; visit prospective agriculture students and parents; maintain communications with school administration; provide individualized or small group instruction to students; supervise greenhouse, livestock, and land laboratory facilities; maintain agriculture program records, student records, and reports; establish new agricultural resource contacts; supervise student agricultural experience programs; and instructor vacation.

During the pilot testing of the survey instrument, item 14, instructor vacation, was determined not to be a true component of a secondary agriculture summer program and was determined negatively to influence the content validity of the instrument. Therefore, while instructor vacation may well be considered an important summer activity for secondary agriculture instructors, the activity was deemed outside the realm of summer program activities and was not used in this study. The remaining 13 activities formed the basis for the study.

Research Question 2

Updating agriculture program curriculum and teaching materials and participating in professional improvement classes and activities with respective means of 1.576 and 1.803 were rated by Idaho public school administrators' as the most important for summer programs (Table 1).

Supervising student agricultural experience programs rated third highest in importance. These ratings contrasted with the findings of other studies that had activities of student contact rated the highest (Arrington, 1983; Camp & Kotrlik, 1985). There was a low importance rating for the activity of supervising greenhouse, livestock, and land laboratory facilities. Other than this case, most of the responses tended to be relatively positive. In addition, most respondents indicated communication between administrators and instructors was at least important (75%). Few deemed communication as not important (5.1%).

Table 1
Public School Administrators' Indication of the Importance of Selected Activities and the Extent Selected Activities Were Being Accomplished in a Secondary Agriculture Summer Program

Importance		Extent Accomplished	
Selected Activities	Mean* Response	Selected Activities	Mean** Response
Update agriculture program curriculum and teaching materials	1.576	Participate in the Vocational Education Summer Conference	1.477
Participate in professional improvement classes and activities	1.803	Participate in fair activities	1.744
Supervise student agricultural experience programs	1.811	Maintain agriculture program facilities and equipment	1.961
Visit prospective agriculture students and parents	1.818	Plan and conduct FFA activities	2.055
Maintain agriculture program facilities and equipment	1.841	Participate in professional improvement classes and activities	2.195
Participate in the Vocational Education Summer Conference	1.879	Supervise student agricultural experience programs	2.197
Maintain communication with school administration	1.917	Update agriculture program curriculum and teaching materials	2.240
Plan and conduct FFA activities	1.923	Visit prospective agriculture students and parents	2.260
Maintain agriculture program records, student records, and reports	2.091	Maintain agriculture program records, student records, and reports	2.268
Establish new agriculture resource contacts	2.159	Maintain communication with school administration	2.299
Participate in fair activities	2.177	Establish new agriculture resource contacts	2.544
Provide individualized or small group instruction to students	2.227	Provide individualized or small group instruction to students	2.592
Supervise greenhouse, livestock, and land laboratory facilities	2.313	Supervise greenhouse, livestock, and land laboratory facilities	2.750

*Very Important = 1, Important = 2, Mildly Important = 3, Not Very Important = 4
**Great Extent = 1, Fair Extent = 2, Slight Extent = 3, Not at All = 4
Superintendents and Principals (n = 136)

Research Question 3

The data indicated the responses were positive. The activities reported to be accomplished greatest were participation in the vocational education summer conference, participation in fair activities, and maintaining agriculture program facilities and equipment (Table 1). Participation in the Vocational Education Summer Conference with a mean of 1.477 rated the highest as to the extent of accomplishment.

Historically, 75 to 80% of the agriculture instructors have participated in the Vocational Education Summer Conference; therefore, the indications from the administrators as to the accomplishment of these activities was not surprising. In addition, the respondents indicated that communication between agriculture teachers and administrations was being accomplished (52.2%). Very few respondents indicated that communication was not being accomplished (11.0%).

Research Question 4

The selected factors thought to limit summer programs were derived from a review of current literature concerning quality secondary agriculture summer programs and were: agriculture program size, instructor's philosophy and priorities, length of summer contract, school's philosophy and priorities, and the agriculture program's funding. The most limiting factor tended to be the agriculture instructor's philosophy and priorities (Table 2). The agriculture instructor's philosophy and priorities was the most limiting factor in accomplishing all of the activities except for maintaining agriculture program facilities and equipment. In this case, the most limiting factor tended to be the agriculture program's funding.

Table 2
Public School Administrators' Indication of Factors Most Limiting the Accomplishment of Selected Activities in an Agriculture Summer Program

	Frequency Percent				
Selected Activities	Program Size	Instructor Philosophy	Contract Length	School Philosophy	Program Funding
Maintain agriculture program facilities and equipment	16 11.8	29 21.3	16 11.8	5 3.7	47 34.6
Participate in the Vocational Education Summer Conference	3 2.2	57 41.9	5 3.7	11 8.1	20 14.7
Participate in professional improvement classes and activities	4 2.9	68 50.0	7 5.1	7 5.1	21 15.4
Plan and conduct FFA activities	18 13.2	50 36.8	20 14.7	3 2.2	9 6.6
Update agriculture program curriculum and teaching materials	3 2.2	49 36.0	10 7.4	11 8.1	32 23.5
Participate in fair activities	17 12.5	50 36.8	16 11.8	4 2.9	6 4.4
Visit prospective agriculture students and parents	14 10.3	59 43.4	17 12.5	3 2.2	6 4.4
Maintain communication with school administration	2 1.5	70 51.5	6 4.4	16 11.8	4 2.9
Provide individualized or small group instruction to students	28 20.6	44 32.4	10 7.4	10 7.4	13 9.6
Supervise greenhouse, livestock, and land laboratory facilities	10 7.4	43 31.6	11 8.1	5 3.7	24 17.6
Maintain agriculture program records, student records, and reports	14 10.3	68 50.0	12 8.8	6 4.4	2 1.5
Establish new agriculture resource contacts	3 2.2	74 54.4	14 10.3	3 2.2	8 5.9
Supervise student agricultural experience programs	13 9.6	54 39.7	20 14.7	1 0.7	7 5.1

Superintendents and Principals (n = 136)

Only 16 respondents surveyed indicated school philosophy as most limiting in accomplishing communication with school administration when compared with 70 respondents (51.5%) indicating instructor philosophy as most limiting. This appeared to agree with the fact that administrators believe communication lies with the instructors' responsibility.

Contract length was surprisingly rated very few times and most limiting in all of the selected activity categories. Using the total number of times the factors were cited as the most limiting factor across the selected activities, instructor's philosophy and priorities was cited 714 times as the most limiting factor and the school's philosophy and priorities was cited the least, at 85 times.

Research Question 5

In an attempt to determine the administrators' opinion of the value of an agriculture summer program to the various entities having a vested interest in the summer program, the administrators were asked to use the categories of very valuable, valuable, slightly valuable, and not very valuable to express their opinion.

The responses indicated Idaho public school administrators placed a positive value on secondary agriculture summer programs (Table 3). Summer programs were perceived to have the greatest value to the agriculture community in the school district, the students in the agriculture program, and the overall agriculture program.

Table 3
Public School Administrators' Indication of the Value a Secondary Agriculture Summer Program Was to Certain Entities of the Community

	Frequency Percent				
Entities	Very Valuable	Valuable	Slightly Valuable	Not Very Valuable	Mean* Response
The Agriculture Community in the School District	51 37.5	44 32.4	21 15.4	9 6.6	1.904
The Students in the Agriculture Program	53 38.2	39 28.7	28 20.6	8 5.9	1.937
The Overall Agriculture Program	43 31.6	50 36.8	26 19.1	9 6.6	2.008
The School District	36 26.5	46 33.8	33 24.3	12 8.8	2.165
The Overall Relation Between the School and Community	35 25.7	45 33.1	35 25.7	12 8.8	2.189
The Overall Community in the School District	27 19.9	44 32.4	44 32.4	10 7.4	2.296

*Very Valuable = 1, Valuable= 2, Slightly Valuable = 3, Not Very Valuable = 4
Superintendents and Principals (n = 136)

Conclusions

1. The individual components listed in the survey instrument were deemed as necessary from recent research, scholarly thought, and leaders in the field of agricultural education. The majority of the respondents rated the selected activities as important.

2. Of the 13 activities listed in the survey, most of the data indicated all of the activities were at least important. Few administrators rated instructor/administrator communication as not important. Most indicated communication as important.

3. The mean response for the extent that the 13 selected activities were being accomplished, was slightly lower then the mean response for the importance of these activities. The activities that were reported to be accomplished most were maintenance of the facilities, participation in the vocational summer conference, and participation in the local fair.

4. The mean response for the extent that communication between agriculture teachers and administrators was being accomplished was reported to be slightly lower than the mean response for the importance of communication.

5. In all but one activity, which was maintenance of agriculture program facilities and equipment, the respondents indicated the most limiting factor as to the accomplishment of the activity was the philosophy of the instructor. This may have been because the survey participants believed the quality of the program was mainly up to the instructor.

6. Program funding and contract length rarely ranked as the most limiting factor.

7. The majority of the respondents indicated the most limiting factor of communication between administrators and agriculture teachers was instructor philosophy.

8. Overall, survey participants were very positive with their responses as to the value the summer program had on the various entities in the community.

Recommendations

1. Most of the activities agriculture instructors participated in during the summer time were perceived to be important instructor/program activities and should be continued.

2. The agriculture instructor's philosophy was one of the most important factors in providing a quality summer program. Agriculture programs with a solid philosophical base have been quality programs in the past as found in the Review of Literature. Instructor philosophy and priorities of summer time activities should be taught to new agriculture teachers and then reinforced through in-service training to beginning teachers and teachers already in the field.

3. Communication between the agriculture instructor, the administrator, and the community must be maintained to insure a quality summer program for students in agricultural education.

References

Arrington, L. R. (1983). SOE - The center of your summer program. The Agricultural Education Magazine, 55(11), 6.

Briers, G. (1983). Summer Programs - From whence did they come? Where Should We Go? The Agricultural Education Magazine, 55(11), 4.

Burton, D. (1989). Alternative summer strategies for secondary agriculture programs. The Agricultural Education Magazine, 61(12), 9.

Camp, S. S. & Kotrlik, J. W. (1985). Activities that should be and are included in summer programs of vocational agriculture in the United States. Journal of the American Association of Teacher Educators in Agriculture, 26(4), 9.

Cepica, M. J. (1979). A comparison of the summer programs of Oklahoma vocational agriculture teachers and administrative perceptions of selected aspects of the summer program. Journal of the American Association of Teacher Educators in Agriculture, 20(1), 18.

Harris, H. H. (1980). The vocational agriculture summer program must change to meet program needs: Fact or fable. The Agricultural Education Magazine, 52(12), 12.

Hilton, J. (1983). Summer programs in vocational agriculture: The administrator's view. The Agricultural Education Magazine, 55(13), 12.

A QUANTITATIVE GUIDE TO ASSESS INSTITUTIONAL EXCELLENCE IN VOCATIONAL EDUCATION

A Critique

Kerry S. Odell, West Virginia University--Discussant

The purpose of this study was to describe the process used in the creation of a quantitative instrument from a qualitative study of the interpretive research paradigm and to determine the instrument's utility in assessing institutional factors which underlie exemplary vocational education programs.

The authors drew on works from the "Schools that Work" movement to qualify the need for research at the institutional level. The need for macro rather than micro study of the education paradigm makes this study especially meaningful. The authors build a conceptual basis for the study that exhibits both explanation credibility and translation fidelity.

Both qualitative and quantitative research methods were employed in this study. The researchers did a credible job describing the procedures used in selecting the institutions to be studied, the instrumentation, and the data collection procedures. An interpretive research design was used in the development of the instrument. This procedure, as described by the authors, arrived at consensus by soliciting input from participants of the exemplary institutions, much like what occurs in a more traditional Delphi study. Although the procedures used are somewhat unconventional and difficult to grasp without significant attention to detail, they are none the less theoretically sound.

This consensus seeking procedure resulted in an instrument (Institutional Effectiveness Assessment Guide) that consisted of six major thematic areas. The authors claim that since the instrument was created from an interpretive perspective it is inherently valid. I would agree that it is as valid, if not more valid, than most instruments reviewed by a "panel of experts". The instrument was then tested for internal consistency using Cronbach's Alpha, and for stability using the test-retest procedure. Results of these procedures were reported. All of the reported estimates of stability would be considered good to excellent. The estimates of internal consistency were not as consistent as one would have expected. Granted, the overall internal consistency estimates were very good, yet some of the thematic areas had poor internal consistency estimates. The authors offered no explanation or speculation as to why this was they case. Would the overall internal consistency be improved if these items were reviewed and reassessed?

The conclusions and recommendations were related to the outcomes of this study. The value and utility of the instrument developed in this study can only be determined when it is used to identify exemplary vocational education programs. I challenge the authors to see that such an endeavor is undertaken.

NAERM Fourth Session
1:30-3:00 p.m.
Concurrent Session J

Theme: Computer Assisted Instruction, Instructional Video and International Agriculture

Topic 1: Predictors of teachers' computer use in Korean vocational agriculture high schools: A proposed framework

Speakers: Seung Il Na, Kirby Barrick (The Ohio State University)
Mu-Keun Lee (Seoul National University)

Topic 2: The perceptions of young farmers regarding the role of international agriculture in agricultural education

Speakers: Kamal Ali Elbasher, Robert Martin (Iowa State University)

Topic 3: Interactive video network educational instructional methods

Speaker: Michael Swan (North Dakota State University)

Topic 4: The effectiveness of computer-assisted instruction in a course on landscape plant use

Speakers: Mona Rae Corbett, Christine Townsend, Jayne Zajicek (Texas A&M University)

Discussant: James Leising (University of California-Davis)

Chairperson: Joe Harper (Clemson University)

Facilitator: Thomas Dormody (New Mexico State University)

PREDICTORS OF TEACHERS' COMPUTER USE IN KOREAN VOCATIONAL AGRICULTURE HIGH SCHOOLS: A PROPOSED FRAMEWORK

Seung Il Na, Adjunct Assistant Professor
R. Kirby Barrick, Professor & Chair
Department of Agricultural Education
The Ohio State University

Mu-Keun Lee, Professor
Department of Agricultural Education
Seoul National University

Introduction

Agriculture teachers have been expected to integrate computing into their programs since the early 1980s (Camp, 1983). Agricultural educators are realizing the benefits of using computer technology in the classroom, not only as a means of addressing technical agriculture subjects but also to provide students with desperately needed computer literacy (Damhof & Sieg, 1982). Teachers are the ones who can sensibly and realistically determine best how computers may be used in the classroom (Hallworth & Brebner, 1980). Agricultural educators must be prepared to use the full potential of computers (Becker & Shoup, 1985).

There are many factors which influence teachers' computer use in a school system. For example, personal attitudes toward computers in a learning environment can be critical to the success of any computer integration program (Clement, 1981). However, most research on computer use in agricultural education has been focused in three general areas: competencies needed by teachers, current status of computer use, and instructional effectiveness of using computers in education (Camp & Sutphin, 1991). If computers are to be extensively used in agricultural education, teacher educators need to determine continuously the predictors of teachers' computer use in secondary vocational agriculture programs.

A Theoretical Framework

A theoretical framework for computer use from a review of literature is shown in Figure 1. Computer training increases computer competence and knowledge (Price, 1986; Madsen & Sebastiani, 1987), decreases computer anxiety (Price, 1986; Johnson, 1987; Fletcher & Deeds, 1992), and increases positive attitudes toward computer use (Price, 1986; Madsen & Sebastiani, 1987). Computer training influences a teacher's attitude toward computers (Martin, 1984; Carey, 1985; Gressard & Loyd, 1985b; Anderson, 1986; Slowiczek, 1989), and computer use in the classroom (Gressard & Loyd, 1985b). Participation in computer training is one of the best indicators of computer use (Bowen & Cheatham, 1986). However, Woodrow (1987) stated that a positive attitude toward computers is not just the product of extensive training in computers.

Computers are a low priority with many teachers who lack knowledge about potential computer applications in the classroom (Steward, 1990). As teachers' knowledge about computers increases, their attitudes towards computers also become more positive (Woodrow, 1990), and they have less computer anxiety (Fletcher & Deeds, 1992; Kotrlik & Smith, 1989; Price, 1986).

Teachers who are computer literate and who have a better understanding of computers are more likely to use computers in their classrooms (DelFrate, 1987). Although teachers lack the computer knowledge and experience to use them effectively in the classroom, Grasty (1986) found that they report positive attitudes toward computers.

Fletcher and Deeds (1992) found that the current level of computer skills explained 53 % of the variance in computer anxiety among secondary agriculture education teachers. Kotrlik and Smith (1989) found five explanatory variables of the variance in computer anxiety among vocational teachers: computer skill level, principal's support, computer availability, perceived math

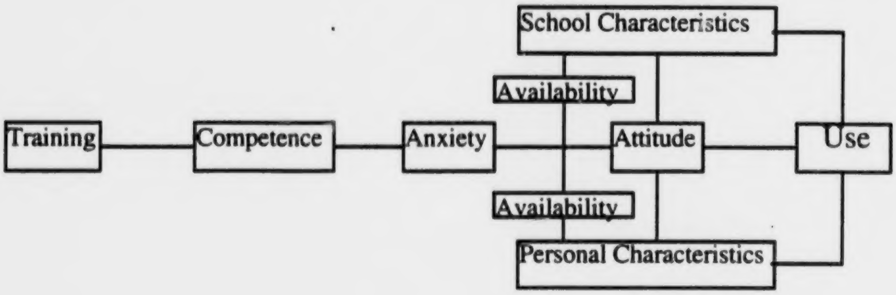


Figure 1
A Theoretical Framework for Computer Use in a School System.

ability, and formal computer training. Computer anxiety may be related to negative attitudes towards computers (Bellando & Winer, 1985; Hagey, 1988) and may reduce the time individuals spend in computer related activities (Bellando & Winer, 1985). Fletcher and Deeds (1992) found that agricultural education teachers' computer anxiety scores had low negative associations with use of the computer and computer training. The most effective way of alleviating computer anxiety may be computer training which provides opportunities for teachers to learn about and work with computers (Lawton & Gerschner, 1982). Kotrlik and Smith (1989) found that teachers who had computers available at school were more likely to have higher levels of computer anxiety. Teachers with a home computer have more positive computer attitudes (Grogan, 1992; Burke; 1986). Grogan (1992), Carey (1985), and Burke (1986) investigated the significant interaction between computer availability to the teacher at home and the teacher's attitude toward computers.

Attitudes are important for study because they are a reflection of an individual's personal perspective and can be strongly predictive of behavior (Kinzie & Delcourt, 1991). Attitudes have been found to predict adoption behavior of new technologies (Anderson, Hansen, Johnson, & Klassen, 1979). Research has shown that successful implementation of computers in education depends on teachers' attitudes toward computers (Woodrow, 1991; Koohang, 1989; Hunter & DeLeeuw, 1988; DelFrate, 1987; Manarino-Lettett & Cotton, 1985; Gressard & Loyd, 1985b; Keenhan, 1983; Lawton & Gerschner, 1982; Stevens, 1980) and their levels of expertise with computers (Manarino-Lettett & Cotton, 1985; Stevens, 1980).

A teacher's reluctance to use a computer comes from computer anxiety, or from a lack of computer skills and information (Beck, 1979). If teachers regard computers negatively or with suspicion, the educational utilization of computers will be limited (Randhawa & Hunt, 1984). In addition, Beauregard (1975), Bowen and Cheatham (1986), and Yuen (1985) found that teachers who have used a computer have a more positive attitude toward computers than those teachers who have not used a computer.

Purpose and Objectives

The purpose of this study was to determine the relationship between selected variables and the computer use of teachers in secondary vocational agriculture programs and to determine predictors of teachers' computer use in secondary vocational agriculture programs. Specifically, the objectives addressed were (1) to determine the relationship between selected variables in the theoretical framework (Figure 1) and computer use of teachers in Korean vocational agriculture high schools, (2) to determine what variables are associated with teachers who have used computers and with teachers who have not, and (3) to determine the proportion of the variance in the discriminant score (computer users or non-users) explained by a set of the selected predictors.

Methods

The design of the study was descriptive and correlational. The population for this study consisted of 1,510 agricultural teachers in 96 Korean secondary vocational agriculture high schools as of 1992 (Ministry of Education, Korea). All teachers in 33 vocational agriculture high schools were selected for the study by using random cluster sampling from the 96 schools stratified by school location and type of school. The researchers were not given access to the teacher's names and addresses.

A survey questionnaire about computers in education was developed by the researchers to secure the information needed for the study. The Korean version of the questionnaire included the following instruments adapted from the previous scales: a 5-point Likert-type attitude instrument (Yuen, 1985; Gressard & Loyd, 1985a; Kay, 1989); computer knowledge and computer skill scales (McCaslin & Torres, 1992); computer anxiety instrument (Oetting, 1983; Marcoulides & Wang, 1990); and locus of control scale (Rotter, 1966).

A panel of experts was used to establish content and face validity. A pilot test was conducted with 26 vocational teachers in Korea, not included in the sample, to establish reliability. The alpha coefficients for the instruments included in the questionnaire were calculated to be .87 for computer attitude (subscales; .79 affective domain, .81 cognitive domain, and .81 behavioral domain), .95 computer knowledge, .97 computer skills, .95 computer anxiety, .94 need for classroom computer use, .87 values of computer applications, and .79 locus of control.

The method of data collection used in this study was a mailed questionnaire. After the initial mailing and a reminder letter, a telephone follow-up was done to 3 nonrespondent schools. A total of 420 of the 564 questionnaires were returned from participants in the 30 schools; this represents a response rate of 74.5 %. A total of 357 usable responses was analyzed. Potential non-response error was handled by comparing of respondents to nonrespondents based on the known characteristics (e.g., age, years of teaching, education level, etc.). There was no difference between the groups.

All data analysis was accomplished with the Macintosh SPSS/PC+ statistical package. The statistical technique used was discriminant analysis. The descriptors proposed by Davis (1971) were used to describe the correlations. An alpha level of .05 was established *a priori* for determining significant differences.

Results

Of the 357 respondents, about 60% had completed some computer training. Fifty-two percent of the teachers have a computer at home. However, 39% of the teachers use computers. Although every vocational agriculture high school has a number of computers, only 31% of the teachers perceived that they could access school computers. Only 3% of the teachers felt no computer anxiety. About 61% of the teachers perceived that computer applications for agricultural education had high or extremely high value. About 41% of the teachers were more external in their locus of control than the other 59%. More than 60% of the teachers perceived that their computer competence was below average level. Agricultural teachers in general showed a positive attitude toward computers in education.

Computer use of the teachers was substantially associated with computer competence (r_{pb}=.61), training (r_{phi}=.60), and availability (r_{phi}=.58). Computer use was also moderately associated with attitude (r_{pb}=.43), ownership (r_{phi}=.39), and anxiety (r_{pb}=-.34). There was a moderately negative relationship between computer anxiety and computer use. Of the attitude domains, affective and behavioral domains were moderately related to computer use, but there was a low relationship between cognitive domain of attitude and computer use. In addition, there was a low relationship between computer use and value (r_{pb}=.16), and needs (r_{pb}=.14). There was a negligent relationship between external locus of control and computer use (r_{pb}=-.05).

Table 1
Means and Standard Deviations for Discriminant Variables

Discriminating Variable	Computer User (n=131) Mean	Computer User (n=131) SD	Non-User (n=206) Mean	Non-User (n=206) SD	p
Attitude	72.2	8.84	63.6	8.31	<.0001
Affective	22.8	4.07	19.7	3.56	<.0001*
Cognitive	25.0	3.02	23.6	3.78	.0005*
Behavioral	24.4	3.81	20.3	4.01	<.0001*
Anxiety	56.6	17.31	73.1	24.57	<.0001*
Value	14.4	3.54	13.0	3.74	.0013*
Needs	29.3	7.09	26.8	7.99	.0037*
Locus of Control	9.8	2.77	10.0	2.53	.3569
Competence	93.2	30.07	51.6	20.83	<.0001*
Training[a]	1.0	.15	.4	.48	<.0001*
Ownership[a]	.8	.43	.4	.48	<.0001*
Availability[a]	.7	.47	.1	.29	<.0001*

a: Dummy coded: Training (yes=1, no=0), Ownership of Personal Computer (yes=1, no=0), Availability of School Computers to a Teacher (yes=1, no=0), and Computer Use (user=1, non-user=0).
* F-test significant at p<.05.

All 357 cases for discriminant analysis were processed, but 20 were excluded from the analysis because they had at least one missing discriminating variable. Table 1 reports means and standard deviations of discriminating variables for both computer user and non-user groups. Of the discriminating variables, only the external locus of control variable could not differentiate between computer user and non-user groups. However, there were statistically significantly differences between the two groups with regard to the discriminating variables except external locus of control.

The summary data for the discriminant analysis are reported in Table 2. The discriminant function explained about 59% of the variance in whether or not teachers have used computers in education. From an examination of the standardized discriminant function coefficients, attitude, training, availability of school computers, competence, ownership of home computer, needs, and value were more descriptive of the computer user group, while cognitive domain attitude, affective domain attitude, anxiety, and locus of control were more descriptive of the computer non-user group than the computer user group. Of the discriminating variables, attitude, cognitive domain attitude, training, availability of school computers, competence, and ownership are relatively more important that needs, value, affective domain attitude, anxiety, and external locus of control. In addition, the most highly discriminating variable associated with the computer-user group was the attitude toward computers in education. The structure coefficients revealed that competence, training, availability of school computers, attitude, affective domain attitude, and anxiety were highly associated with the computer user or non-user groups in teachers of agriculture. Of the 337 cases analyzed, about 89.3% were predicted correctly by the discriminant function in their respective membership groups.

Table 2
Summary Data for Discriminant Analysis

			Discriminant Function	
Variables	b	s	Group	Centroids
Attitude	.44	.42	Non-User (n=206)	-.93
Affective Domain	-.08	.35	User (n=131)	1.46
Cognitive Domain	-.40	.17		
Anxiety	-.08	-.31		
Value	.02	.15		
Needs	.09	.14		
Locus of Control	-.02	.04		
Competence	.32	.70		
Training	.43	.66		
Ownership	.29	.36		
Availability of School Computers	.38	.64		

Eigenvalue	Rc	Wilks' Lambda	p
1.356	.759	.424	<.0001

b = Standardized discriminant function coefficient
s = Pooled within-groups structure coefficient
Rc = Canonical correlation coefficient
Note: The Behavioral Domain variable was excluded in the discriminant function model because it failed to the tolerance test.

Conclusions

Computer use of the teachers was substantially associated with computer competence, training, and perceived availability of school computers. The variables with a moderate relationship of computer use were attitude, ownership, and anxiety. Of the attitude domains, affective and behavioral domains were moderately related to computer use, but there was a low relationship with cognitive domain. In addition, there was a low relationship between computer use and perceived value of computer applications, and perceived needs for classroom computer use. There was a negligent relationship between external locus of control and computer use.

Computer attitude (cognitive domain attitude), computer training, availability of school computers, computer competence, and ownership of personal computer at home are relatively more important variables in the discriminant function. The most highly discriminating variable associated with computer-user group was the attitude toward computers in education. The discriminant function explained about 59% of the variance in whether or not teachers have used computers in education. It can be concluded that results confirmed the theoretical model in the study. Of the "personal characteristics," however, external locus of control did not confirm the model, and perceived value of computer use and felt needs for classroom computer use were not important variables in the model.

Implications and Recommendations

The attitude of agricultural teachers toward computers is the most important discriminating variable whether or not they use computers in education. An effort should be made to reduce the differences in the attitudes among current teachers by providing them with computer training to increase competence in computer use, decrease computer anxiety, and develop a positive attitude toward computers. Effort should also be made to develop positive attitudes of prospective teachers toward computers in order to more incorporate computer technology into agriculture education programs in the future. Another implication is that availability of school computers perceived by agricultural teachers is the highly important variable whether or not they incorporate computer technology into their instruction. Although there are some computers available in agricultural education programs, some teachers do not perceive that they can access those computers. Therefore, all teachers should be allowed to access school computers. The other discriminating variables in this study should also be considered to promote more teachers' computer use for agricultural education. The theoretical framework for computer use shown in Figure 1 should be tested to determine if the framework is consistent in another group of teachers. It is recommended that further study should include some "school characteristics" (e.g., principal leadership) in the model.

References

Anderson, J. A. (1986). Microcomputer exposure related to elementary teacher concerns about the educational use of microcomputers. Unpublished doctoral dissertation, University of Minnesota.

Anderson, R. E., Hansen, T. P., Johnson, D. C., & Klassen, D. L. (1979). Minnesota computer literacy and awareness assessment. St. Paul: Minnesota Educational Computing Consortium.

Beauregard, R. J. (1975). Construction and validation of a scale to measure preservice the attitudes of teachers toward computers. Unpublished doctoral dissertation, West Virginia University.

Beck, J. J. (1979). An analysis of student attitude toward computer-assisted instruction in Nebraska public high schools. Unpublished doctoral dissertation, University of Nebraska.

Becker, W. J. & Shoup, W. D. (1985). The microcomputer as an instructional tool. The Journal of the American Association of Teacher Educators in Agriculture, 26(2), 65-72.

Bellando, J. & Winer, J. L. (1985). Computer anxiety relationship to math anxiety and Holland types. Austin, TX: Southwestern Psychological Association.

Bowen, B. E. & Cheatham, D. L. (1986). Adoption of computer technology by agricultural educators. Proceedings of the 40th Annual Central States Research Conference in Agricultural Education.

Burke, M. W. (1986). The effects of inservice microcomputer training on teachers' attitudes towards educational computing. Unpublished doctoral dissertation, University of Alabama.

Camp, W. G. (1983). Microcomputers: A "byte" of the action. The Agricultural Education Magazine, 55(1), 13-14.

Camp, W. G. & Sutphin, H. D. (1991). Integrating microcomputers and related technologies in agricultural education. Journal of Agricultural Education, 32(1), 41-46.

Carey, D. M. (1985). An investigation of factors that affect elementary school teachers' use of computers. Unpublished doctoral dissertation, University of Oregon.

Clement, P. (1981). Affective considerations in computer based education. Educational Technology, 21, 28-32.

Damhof, D. & Sieg, S. (1982). Ag students join the computer generation. Voc Ed Magazine, 57(3), 41-42.

Davis, J. A. (1971). Elementary survey analysis. Englewood Cliffs, NY: Prentice-Hall.

DelFrate, J. (1987). An investigation of teachers' backgrounds, usage, and attitudes towards computers in education. Unpublished doctoral dissertation, The Ohio State University.

Fletcher, W. E. & Deeds, J. P. (1992). Factors preventing microcomputer use among secondary agriculture education teachers in the United States. Proceedings of the 1992 National Agricultural Education Research Meeting.

Grasty, C. A. (1986). A survey analysis of teacher attitudes, knowledge, and willingness to take computer training in public schools [Doctoral dissertation, Temple University, 1985]. Dissertation Abstracts International, A46/08, 2270.

Gressard, C. P. & Loyd, B. H. (1985a). Validation studies of a new computer attitudes scale. Paper presented at the 69th Annual Meeting of the American Educational Research Association (Chicago, IL, March 31-April 4).

Gressard, C. P. & Loyd, B. H. (1985b). Age and staff development experience with computers as factors affecting teacher attitudes toward computers. School Science and Mathematics, 85(3), 203-209.

Grogan, V. C. (1992). Computer attitudes of selected students and educators in relationship to computer access and experience and gender [Doctoral dissertation, The University of Nebraska, 1991]. Dissertation Abstracts International, A52/12, 4205.

Hagey, M. S. (1988). The computer: An assessment of teacher training, teacher attitudes, and computer inventory (Hardware and software) in grades K-8 in the metropolitan public schools of Nashville-Davidson county (Tennessee) [Doctoral dissertation, Tennessee State University, 1985]. Dissertation Abstracts International, A48/11, 2850.

Hallworth, H. J. & Brebner, A. (1980). Computer assisted instruction in schools: Achievements, present developments, and projections for the future. (ERIC ED200185).

Hunter, W. & Deleeuw, G. (1988). Computers in teacher education. Halifax: Association for Media and Technology.

Johnson, N. D. (1987). Effects of inservice training on writing apprehension and computer anxiety in elementary school teachers. Dissertation Abstracts International, 48(4), 904.

Kay, R. H. (1989). A practical and theoretical approach to assessing computer attitudes: The computer attitude measure (CAM). Journal of Research on Computing in Education. 456-463

Keenhan, C. E. M. (1983). An assessment of the attitudes of public school teachers toward microcomputers. Unpublished doctoral dissertation, Wayne State University.

Kinzie, M. B. & Delcourt, M. A. B. (1991). Computer technologies in teacher education: The measurement of attitudes and self-efficacy. American Educational Research Association. (ERIC ED331891).

Koohang, A. A. (1989). A study of the attitudes of pre-service teachers toward the use of computers. Educational Communication and Technology Journal, 35(3), 145-149.

Kotrlik, J. W. & Smith, M. N. (1989). Computer anxiety levels of vocational agriculture teachers. Journal of Agricultural Education, 30(2), 41-48.

Lawton, J. & Gerschner, V. T. (1982). A review of the literature on attitudes towards computers and computerized instruction. Journal of Research and Development in Education, 16(1), 50-55.

Madsen, J. M. & Sebastiani, L. A. (1987). The effect of computer literacy instruction on teachers' knowledge of and attitudes toward microcomputers. Journal of Computer Based Instruction, 14(2), 68-72.

Manarino-Lettett, P. & Cotton, B. (1985). Attitudes of teachers toward the use of computers in the schools. (ERIC ED280455).

Marcoulides, G. A. & Wang, X. (1990). A cross-cultural comparison of computer anxiety in college students. Journal of Educational Computing Research, 6(3), 251-263.

Martin, E. P. (1984). Teacher attitudes toward the use of computers in the educational process. Unpublished doctoral dissertation, Texas A & M University.

McCaslin, N. L. & Torres, R. M. (1992). Examining attitudinal factors related to agriculture teachers' perceived microcomputer competence. Proceedings of the Nineteenth Annual National Agricultural Education Research Meeting. St. Louis, Missouri.

Ministry of Education. (1992). Directory of the 1992 National Vocational Agriculture and Fisheries High Schools. Korea.

Na, S. I. (1993). Variables associated with attitudes of teachers toward computers in Korean vocational agriculture high schools. Unpublished doctoral dissertation, The Ohio State University.

Oetting, E. R. (1983). Manual: Oetting's computer anxiety scale (COMPAS). Ft. Collins, CO: Rocky Mountain Behavioral Science Institute, Inc.

Price, W. L. (1986). The effects of in-service workshops on computer anxiety in elementary teachers [Doctoral dissertation, Virginia Polytechnic Institute and State University, 1985]. Dissertation Abstracts International, A46/08, 2183.

Randhawa, B. S. & Hunt, D. (1984, Spring). Computers and computer literacy in contemporary psychological, socio-economic and education context. AEDS J., 1-11.

Rotter, J. (1966). Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs, 80 (1), 1-27.

Slowiczek, F. M. (1989). Determining variations in computer usage by secondary science teachers as influenced by state dissemination of software and instructional aids [Doctoral dissertation, Northern Arizona University, 1988]. Dissertation Abstracts International, A49/10, 3002.

Stevens, D. J. (1980). How educators perceive computers in the classroom. AEDS Journal, 13(3), 221-232.

Steward, H. R. (1990). A study of the attitudes of Southeast Texas elementary principals and teachers toward the microcomputer. Unpublished doctoral dissertation, The Texas A&M University.

Woodrow, J. E. J. (1987). Educators' attitudes and predispositions towards computers. Journal of Computers in Mathematics and Science Teaching, 27-37.

Woodrow, J. E. J. (1990). Locus of control and student teacher computer attitudes. Computers and Education, 14(5), 421-32.

Woodrow, J. E. J. (1991). Teachers' perceptions of computer needs. Journal of Research on Computing in Education, 23(4), 475-493.

Yuen, C. Y. (1985). Attitudes of trade and industrial teachers toward the use of microcomputers. The Journal of Vocational Education Research, 10(2), 51-64.

THE EFFECTIVENESS OF COMPUTER-ASSISTED INSTRUCTION IN A LANDSCAPE PLANT USE COURSE

A Critique

Michael F. Burnett, Louisiana State University--Discussant

The researchers are commended for addressing a topic that continues to be significant in Agricultural Education. The introduction is well written and clearly establishes the rationale for the study. The conceptual framework for the study, although not extensive, is well developed and supported by appropriate literature

Research procedures utilized in the study were appropriate and clearly described. The researchers are especially commended for the use of a comparative design in attempts to answer the research questions rather than an easier one group or survey design.

There were, however, a few questions raised as the research report was reviewed. These questions included:

Did the researchers consider the possibility of using analysis of covariance with the pre-test scores as covariates rather than comparing gain scores? Even though the differences in pre-test scores were not significant among the treatment groups, this analysis might have produced a more accurate comparison of the groups. Kerlinger, in referring to this procedure, suggests that even non significant pre-test differences might have, "tipped the Statistical Scales" (Kerlinger, 1986, p. 340).

Was alpha the appropriate measure for estimating the reliability of the knowledge tests in the study? Cronbach's alpha is typically used for scales while other reliability measures such at KR 20 or the split- halves method is used for dicotomously scored tests.

What was the alpha level used in the study? The researchers report significant differences at the .10 level and at the .05 level. Was .10 established a' priori in the study?

Why was the attitude scale not used both as pre- and post-tests? This would seem especially appropriate since the researchers suggest that, ". . . it was thought that the groups using CAI would have had different attitudes toward computers." Perhaps the differences did exist before the treatment.

The attitude statements were interpreted as positive or negative statements toward computers. However, were all of the statements clearly directional? For example, is disagreement with the statement, "Computers can make important decisions better than people" an indication of a negative attitude toward computers?

Finally, how was the independent variable, learning style entered into the regression model? Reported data seem to indicate that it was entered as a continuous variable rather than as nominal categorical data.

PERCEPTIONS OF YOUNG FARMERS REGARDING THE ROLE OF INTERNATIONAL AGRICULTURE IN AGRICULTURAL EDUCATION

Kamal Ali Elbasher
Research Assistant
Iowa State University

Robert A. Martin
Professor
Iowa State University

Introduction

Greater awareness of international agriculture is important as trade relationships take American farmers into the global market. An understanding of international agriculture is critically important to every one who works in the agriculture sector. A high degree of knowledge is requisite for future workers in the agriculture sector and a thorough understanding of world agricultural issues is no less important to those who seek careers in agriculture (Wood & Rosati, 1990). The need for an awareness of the global nature of the agricultural industry has become one of the major needs of our time. It has become increasingly apparent that if a person is to be considered educated in agriculture, he/she must be cognizant of the interrelationships of various agricultural systems and governments, cultures and societies in which they function. No longer it is sufficient to know how to produce food and fiber and conduct or manage the many tasks in today's agricultural industry (Martin, 1989).

Historically, the guiding purpose for vocational education in agriculture in the U.S. has been "to train present and prospective farmers for proficiency in farming" (Meaders, 1990, p. 2). The attainment of this aim was said to involve an understanding of the problems of production and marketing of products on a local, state, national, or international basis. In addition, the aim included the study of relationships of the farm home, community service, and leadership.

In recent years, many questions have been raised regarding the need for adult and young farmer education delivered through vocational agriculture departments as well as concern about the focus of these programs. In a study of educational programs for young and adult farmers, Martin and Bia (1986) found that while there was a general recognition for the need to help young farmers, they did not find a single study regarding the role of international agriculture in agricultural development and education as perceived by young farmers in Iowa. Since young farmers are an important part of the agricultural community, their perceptions toward the role of international agriculture must be identified. These perceptions can be assessed through the current agricultural education programs being offered to young and adult farmers in Iowa.

The cognitive information concerning the international agricultural technologies that farmers possess has not been widely investigated. Nor has the literature revealed any studies concerning the relative understanding of these issues. It was with these concerns in mind that this study was conducted. This study is one in a series of studies being conducted to provide a basis for revision of present agricultural education programs and could provide information for the development of new educational programs in international agriculture at secondary and post-secondary educational institutions. Also, it is anticipated that the findings from this study will serve as important reference material to students who may be interested in doing further work in this area. A study of this nature is useful in bringing about a clear understanding of the importance of the role of international agriculture in development and education in Iowa, and could have implications for educational programs in other states (Martin, 1989).

Purpose and Objectives

The primary purpose of this study was to identify and assess international agricultural knowledge and skills needed by Iowa young farmers. A secondary purpose was to determine their perceptions regarding international agriculture issues and how agricultural education and extension systems could enhance the development of a global agricultural awareness among Iowa farmers. Specific objectives were: 1) to identify the importance of selected topics related to international agriculture, 2) to identify the level of interest of Iowa young farmers in studying selected topics in international agriculture, 3) to identify perceptions held by Iowa young farmers regarding selected issues in international agriculture, and 4) to compare topic area importance, educational interest levels and perceptions based on selected demographic data.

Methods and Procedures

The study was conducted using the descriptive survey method. The term "descriptive research" represents a broad range of activities that have a common purpose of describing situations or phenomena (Mason & Bramble, 1978). These descriptions may be necessary for decision-making or to support broader research objectives. Descriptive research is also used to describe the characteristics of Iowa young farmers as learners, and supply information on their perceptions regarding selected issues in international agriculture. The population included all members of the Iowa Young Farmers Educational Association (IYFEA). The 1991 membership was about 200 young farmers (IYFEA, 1991). The final list of members consisted of only 158 active members who qualified for this study. The remaining number were either no longer active or associate members. The development of the survey instrument was based on an adaptation of questionnaires used by other researchers (Omer, 1987). Four major areas and thirty-five related topics were identified. Respondents indicated the degree of importance and level of interest regarding each topic on a five-point Likert scale ranging from one (not important/no interest) to five (very important/very interested). They indicated their perceptions regarding selected issues in international agriculture on a five-point Likert scale ranging from one (strongly disagree) to five (strongly agree). Data collection was accomplished through the use a mail questionnaire. The questionnaires were mailed together with a cover letter explaining the purpose and the need for the study. Follow-up letters and phone calls were made to ten randomly selected nonrespondents to assess any differences in responses compared to the individuals originally responding. There were no significant differences between these responses and those of the original respondents.

Of the 158 young farmers in the population, 51 responded to the initial mailing. Through the follow-up procedures, an additional 35 questionnaires were returned for a total response of 86 questionnaires or 54.4%. Of the 86 returned questionnaires, there were 78 usable survey forms. The final response rate of 54.4% was considered to be adequate given the fact that, traditionally, farmers do not respond well to surveys (Lasley, 1985; Howe, 1981).

Analysis of Data

Because the study involved the use of the total population, it was decided that descriptive statistics would be the most appropriate for data analysis. The data were analyzed to meet the specific objectives of the study. The data were analyzed using means, standard deviations, frequencies and percentages. Cronbach's Alpha reliability coefficients were determined for each of the three major scales as follows: importance scale was 0.94, interest scale was 0.96, while it was 0.70 for perception scale. The coefficient values were deemed to be sufficiently high to proceed with analysis and interpretation. According to Nunnally (1982), an alpha greater than 0.65 is the minimum recommended for research purposes.

Results

Objective one of this study was to identify the importance of selected topics related to international agriculture as perceived by Iowa young farmers. It was observed that two topics in livestock production received a rating of four or above. The remaining topics in livestock production were rated between 2.67 and 3.44. Five topics in crop production received a rating of

3.50 or higher. The remaining topics in crop production were rated between 2.99 and 3.36. It was also observed that topics related to livestock, crop production, and agribusiness education such as marketing, pests and diseases, crop pesticides, new crop varieties and chemical safety problems in other countries received the highest ratings in the four broad areas (Tables 1, 2, 3 & 4). The findings suggested that most of the topics in the four broad areas were confirmed by the respondents to be important. As a group, they rated most of these topics three or above, a rating of "some" or above in the importance scale. The relatively low importance rating of selected topics in horticulture such as landscaping and turf management was observed in this study (Table 3). These findings were consistent with a related research report indicating that the low ratings regarding horticulture topics may be due to lack of knowledge concerning these topics and/or a lack of emphasis on these topics in the young farmer education program (Omer, 1987).

Table 1
Importance and Level of Interest in Selected Topics in Livestock Production in International Agriculture as Rated by Iowa Young Farmers

	Importance		Interest	
Topic	Mean	S.D.	Mean	S.D.
Marketing of livestock	4.60	0.96	3.97	1.02
Health and diseases	4.01	0.87	3.29	1.08
Breeding and reproduc.	3.44	0.88	3.19	1.16
Use of computer	3.19	1.01	2.83	1.05
Production management	3.10	0.92	3.04	0.97
Feeds and feeding	3.04	0.90	3.00	1.06
Production records	2.86	0.94	2.76	0.93
Record keeping	2.76	0.99	2.68	0.97
Group Summary	3.37	0.90	3.09	1.03

Scale: 5= very important/interested; 4= important/interested; 3= somewhat important/interested; 2= of little importance/interest; 1= not important/no interest.

Table 2
Importance and Level of Interest in Selected Topics in Crop Production in International Agriculture as Rated by Iowa Young Farmers

	Importance		Interest	
Topic	Mean	S.D.	Mean	S.D.
Importance of pests and diseases	4.32	0.80	3.51	1.02
Crop pesticides	3.64	0.94	3.33	1.03
Marketing of crops	3.63	0.91	3.28	1.04
New crop varieties	3.63	0.88	3.51	1.05
Chemical safety	3.56	0.97	3.06	1.06
Crop Prod. Management	3.36	0.90	3.17	1.05
Soil fertility	3.13	0.99	2.87	1.01
Crop prod. records	3.04	0.97	2.77	0.98
Use of computer	2.99	1.12	2.81	1.08
Group Summary	3.48	0.94	3.15	1.03

Scale: 5= very important/interested; 4= important/interested; 3= somewhat important/interested; 2= of little importance/interest; 1= not important/no interest.

Table 3

Importance and Level of Interest in Selected Topics in Horticulture in International Agriculture as Rated by Iowa Young Farmers

Topic	Importance Mean	Importance S.D.	Interest Mean	Interest S.D.
Fruit production problems	3.10	0.98	2.34	1.12
Vegetables produ. problems	3.09	1.00	2.36	1.08
Landscaping problems	2.23	0.96	2.01	1.02
Turf management problems	2.16	0.86	1.86	0.85
Group Summary	2.64	0.95	2.14	1.01

Scale: 5= very important/interested; 4= important/interested; 3= somewhat important/interested; 2= of little importance/interest; 1= not important/no interest.

Table 4

Importance and Interest in Selected Topics in General Agriculture in International Agriculture as Rated by Iowa Young Farmers

Topic	Importance Mean	Importance S.D.	Interest Mean	Interest S.D.
Government programs	3.96	0.89	3.62	1.04
Water quality	3.94	1.02	3.45	1.16
Natural resources	3.92	0.91	3.50	1.13
Government regulations	3.90	0.88	3.59	1.09
Air quality	3.90	1.06	3.37	1.15
Agricultural credits	3.73	0.91	3.53	1.05
Leadership in agriculture	3.68	1.06	3.31	1.10
Human relations in agri.	3.60	1.00	3.17	1.10
Financial planning	3.51	0.96	3.22	0.98
Wildlife management	3.44	1.08	3.13	1.04
Taxes	3.37	0.94	3.14	1.04
Decision making process	3.28	0.88	3.05	0.95
Land tenure systems	3.13	1.05	3.01	1.04
Computer use	3.12	0.99	2.90	1.04
Group Summary	3.61	0.97	3.29	1.06

Scale: 5= very important/interested; 4= important/interested; 3= somewhat important/interested; 2= of little importance/interest; 1= not important/no interest.

Objective two of this study was to identify the level of interest in studying selected topics in international agriculture as perceived by Iowa young farmers. The level of interest in studying selected topics in international agriculture indicated the highest rated topic was "marketing of livestock" (3.97), followed by health and diseases, breeding and reproduction, production management, and feeding systems. Interest in crop production topics produced data which indicated five topics received a rating of three or above. These were as follows: (1) new crop varieties, (2) pests and diseases, (3) pesticides, (4) marketing systems and (5) crop production management in other countries (Tables 1, 2, 3 & 4). The results of interest ratings related to horticulture were relatively low. These results were consistent with the earlier report by Omer (1987). The general agriculture topics which received 3.5 and above were: government programs, government regulations, agricultural credit, and natural resources (Table 4). On most of the topics in the four broad areas the respondents' ratings were between "interested" and "somewhat interested" (3 or above) in studying international agriculture related topics. This finding reflected that most of the topics in the four areas were confirmed to be of interest to the respondents. Three significant differences were found in the level of interest in program areas in international agriculture when the respondents were compared by the type of farmer (full-time vs. part-time). The differences were detected at the .05 level concerning agricultural topics in crop production, horticulture, and general agriculture (Table 5). In each of these topic areas, part-time farmers indicated higher levels of interest in international agriculture as related to these topics than full-time farmers.

Table 5
A Comparison of the Level of Interest Regarding Selected Topic Areas in International Agriculture when Iowa Young Farmers are Grouped by Full-time and Part-time Farmers

	Type of Farmer							
	Full-Time			Part-Time				
Topic Area	n	Mean	S.D.	n	Mean	S.D.	t-value	prob.
Livestock Production	59	2.99	.78	15	3.39	.84	-1.75	0.085
Crop Production	59	3.03	.79	15	3.50	.74	-2.10*	0.039
Horticulture	58	1.95	.82	15	2.61	1.09	-2.59*	0.011
General Agriculture	59	3.17	.83	15	3.75		-2.51*	0.014

*Significant at .05 level.

The third objective of this study was to identify perceptions held by Iowa young farmers regarding selected issues in international agriculture. The respondents were asked to indicate to what extent they agreed or disagreed with fifteen statements concerning international agriculture issues in providing assistance to young farmers. The statements were rated on a five-point scale where one indicated a maximum degree of disagreement and five indicated a maximum degree of agreement. The general perceptions of farmers included a strong indication for some form of a global outreach program in agricultural education. The six highest perception statements dealt with this issue. The preference was for educational programs offering some international agricultural topics. The low rating of the statements "even if agricultural training were offered, agricultural practices would not change" and "U.S.A. farmers have no need for international technical knowledge" could be interpreted in a positive manner. The relatively low ratings suggested disagreement with both statements which means that there was a potential that agricultural practices could be improved with the introduction of international agriculture training programs and U.S.A. farmers could learn some international technical knowledge which might help in crop and livestock production (Table 6). The low rating of perceptions regarding job and business opportunities in agriculture in other countries indicated a lack of confidence in, but perhaps not a firm attitude toward, present levels of economic activity in agriculture (and perhaps economic development in general) in the world. In summary, the findings show that the respondents were, in general, between "neutral" and "some" agreement regarding the perception statements on international agriculture issues.

Table 6

Means, Standard Deviations, and Rankings on the Level of Perception of Iowa Young Farmers Regarding Selected Issues in International Agriculture.

Statements	Missing Cases	Valid Cases	Mean	S.D.
1. The USA produces high quality crop and livestock compared to most international producers.	0	78	4.13	.87
2. International farmer exchange programs will encourage farmers to learn about international agriculture.	0	78	3.80	.81
3. International agricultural education programs should be offered to help understand of current international market trends.	0	78	3.73	.85
4. Consider adopting new agricultural practices used by farmers in other countries.	0	78	3.72	.77
5. Educational programs for farmer should offer some international agriculture topics.	0	78	3.72	.72
6. High school and college students should study agricultural topics related to international agriculture.	0	78	3.71	.79
7. Agricultural educators must try to give examples from other countries' agricultural production system along with the USA system.	1	77	3.69	.82
8. Consider traveling to other countries to visit farmers.	0	78	3.65	1.04
9. Agricultural training should include some information of agricultural products from other countries.	0	78	3.64	.82
10. The USA should protect farmers by restricting the importation of agricultural products from other countries.	0	78	3.60	1.19
11. International agriculture programs should be offered in order to understand problems that farmers face in other countries.	0	78	3.49	.81
12. There are many business opportunities in agriculture in other countries.	0	78	3.46	.91
13. There are many job opportunities in agriculture in other countries.	0	78	3.35	.94
14. Even if agricultural training was offered related to international agriculture, agricultural practices would not change.	0	78	2.60	.93
15. USA farmers have no need for international technical knowledge in crop and livestock production.	0	78	2.00	1.07

Scale: 5=strongly agree; 4=somewhat agree; 3=neutral; 2=somewhat disagree; 1=strongly disagree.

Conclusions

It is important to note that: (a) as a group, farmers participating in the study were highly educated, their income was fairly high, most were full-time farmers, and the majority were between 20 and 39 years of age. These findings are important for agricultural educators who need to be responsive to the needs of Iowa young farmers when educational and training programs are being developed; (b) farmers indicated that most of the selected topics related to international agriculture in the four broad areas were important. They perceived the importance of topics related to livestock and crop production and agribusiness education such as marketing, pests and diseases, new crop varieties and chemical safety problems in other countries, as the highest ratings in the four broad areas; (c) farmers were primarily interested in international agriculture topics which dealt with livestock production, crop production, general agriculture, and horticulture, in descending order; (d) the general perceptions of the farmers included a strong indication for some form of a global outreach program in agricultural education and extension; (e) most of the observed differences involved part-time farmers who indicated higher levels of interest and perceived some statements related to international agriculture significantly higher than full-time farmers; (f) farmers rated international agriculture topics related to environment (government programs, government regulations, water quality, air quality, etc.) fairly high on the importance and interest scales.

Recommendations

Based on the findings of this study, the following recommendations were made: (1) agricultural education should be delivered with a global perspective throughout the state of Iowa to meet the needs and interests of local agricultural producers; (2) educational programs should be planned and/or revised for present and future young farmers to emphasize the international agriculture topics with highest priority; (3) agricultural education should initially focus on approved basic practices in other countries which deal with environmental issues; (4) agricultural education should offer educational programs including farmer exchange programs to help farmers understand and learn more about international agriculture; (5) this study supports more international content in current educational programs, therefore, topics related to international agriculture should be taught in schools and colleges; (6) various variables need to be considered in planning programs in international agriculture, e.g., type of farmer and the planning involved.

Educational Implications

High priority ratings for the importance and interest in topics related to livestock, crop production and agribusiness education such as marketing, pests and diseases, and new crop varieties in other countries reflect the current situation among the members of IYFEA. This finding is consistent with a study conducted by Omer (1987) in which he studied the farmers' use of extension. This finding will motivate agricultural educators to plan and/or revise current educational programs to emphasize the international agriculture topics with the highest priority. The general perceptions of these young farmers included a strong indication for some form of a global outreach program in agricultural education. This finding is significant because it represents strong support for the new approach of "internationalizing the curriculum". The data also indicate that part-time farmers consider traveling abroad to visit farmers and training programs in international agriculture as a trend among Iowa farmers because of their current involvement in several international agricultural trade agreements (e.g. Russia, Japan, etc.). Finally, the data indicate that Iowa young farmers want more international agriculture education and they are willing to participate in any educational programs dealing with this issue.

References

Howe, M. J. (1981). Adult Learning: Increasing Participation and Facilitating Learning. San Francisco: Jossy-Bass Publishers.

Iowa Young Farmer Educational Association (IYFEA). (1991). List of membership. Des Moines: Iowa Department of Education.

Lasley, P. (1985). Iowa Farm Poll. Ames: Iowa State University.

Martin, R. A. (1989, April). A Global Perspective for Agricultural Education. The Agricultural Education Magazine 61(10): 4-5.

Martin, R. A. & Bia, J. (1986). Educational Programs for Young and Adult Farmers: A Needs Assessment and Analysis--Final Report. Ames: Iowa State University,.

Mason, E. J. & Bramble, W. J. (1978). Understanding and Conducting Research. New York: McGraw-Hill Book Company.

Meaders, O. D. (1990). Vocational Agricultural Education in Taiwan and U.S.A.: A Comparison on Selected Points. Paper presented at the Sixth Annual Conference of the Association for International Agricultural and Extension Education, Chevy Chase, Maryland.

Nunnally, J. C. (1982). Reliability of Measurement. In H. D. Mitzel (Ed.), Encyclopedia of Educational Research. New York: Free Press.

Omer, M. H. (1987). Analysis of Selected Factors Associated with Participation of Iowa Young Farmers in Agricultural Extension Programs. Unpublished doctoral dissertation, Ames: Iowa State University.

Wood, J. A. & Rosati, R. R. (1990). Agriculture of Developing Countries: What Our Students Know. Paper presented at the Sixth Annual Conference of the Association for International Agricultural and Extension Education, Chevy Chase, Maryland.

PERCEPTIONS OF YOUNG FARMERS REGARDING THE ROLE OF INTERNATIONAL AGRICULTURE IN AGRICULTURAL EDUCATION

A Critique

Michael F. Burnett, Louisiana State University--Discussant

The researchers are commended for investigating a topic that continues to grow in importance in today's increasingly global society. The introduction is clear and well written and the study is founded on a well developed conceptual framework. The purpose and objectives of the study clearly derive from the framework presented.

Research procedures used in the study are appropriate, clearly described, and well documented. The data collection procedures are clear and the nonresponse follow-up procedures are especially commendable. In addition, the examination of the similarity of the findings of this study to previous research and carrying the results to implications is a very appropriate activity and is worthy of note.

Some questions that were identified as the research was reviewed include the following:

What procedure was used to establish the content validity of the researcher developed instrument? The researchers report that, "the development of the survey instrument was based on an adaptation of questionnaires used by other researchers." Would this process provide an adequate basis for the validity of the instrument in this study? It seems questionable.

Would the reporting of mean levels of perceived importance/ interest have been clearer with an established interpretive scale. The researchers report that, "On most of the topics in the four broad areas the respondents ratings were between 'interested' and 'somewhat interested' (3 or above)." Does this mean that "Computer Use" with a mean of 2.9 would be classified as "of little interest?" Perhaps a set of guidelines established to interpret the mean responses would have been beneficial. In the absence of such guidelines, this reviewer would use the midpoint for an interpretive break (i.e. - 2.5 to 3.5 would be somewhat interested, etc.).

Why were inferential statistics used to compare responses by type of farmer when the researchers indicate that, "Because the study involved the use of the total population, it was decided that descriptive statistics would be the most appropriate for data analysis."

Finally, why were conclusions derived in the report from data not presented in the findings? The researchers conclude that, ". . . farmers participating in the study were highly educated, their score was fairly high . . ." The findings on which this was based were not evident to this reviewer in the research report.

INTERACTIVE VIDEO NETWORK - EDUCATIONAL INSTRUCTIONAL METHODS

Michael K. Swan
Assistant Professor
Agricultural & Extension Education
North Dakota State University

Introduction and Background

Education must overcome the challenges of declining enrollment, increased graduation requirements, and lack of funding for elective courses (National Research Council, 1988). According to Kitchen (1987), America's rural communities face increased challenges for providing equitable services and economic stability.

Technology has produced an alternative: the use of interactive video networks (Whisler, 1988). Rural schools interact with other schools via interactive video networks--a type of distance learning. Distance learning is characterized by the use of technology to link instructors and learners who are physically apart from one another (Hughes, 1988).

Distance education technology can provide a medium that will allow school districts to have an equitable share of the opportunities for advanced courses and other course that rural school districts may not be able to provide (Whisler, 1988).

Distance learning provided by video and audio technologies via interactive video networks (IVN) has helped to alleviate some of the problems facing rural America such as geographic isolation, declining enrollment, shrinking tax bases, and increased requirements for high school graduation (Whisler, 1988). As classes become smaller, the financial burden increases as a result of decreased state funds and retained costs of instructors and facilities (Mihalevich, 1990). By not offering low-enrollment classes, schools deprive students of educational opportunities. Rural school districts without access to an interactive video network face two options: provide instructors for low-enrollment classes and thereby take on greater financial burden, or eliminate low-enrollment classes and ultimately leave students at an educational disadvantage (Whisler, 1988).

Much of the application of IVN is to provide courses that otherwise would not be offered due to minimal student enrollment or to comply with increased state requirements for courses that must be offered. Distance learning provides students with opportunities to enroll in courses they may not have had the opportunity to experience previously. Distance learning also provides school districts with opportunities to offer classes in subjects for which many school districts do not have qualified instructors. Teacher/staff in-service and student development courses are other possibilities (Evans, 1988).

Another benefit for students who participate in IVN is the capability for videotaping classes if students are absent. Potential uses of interactive video networks are limited only by imagination, time, and budget (deBlas, Knox, McArthur, Wallace, & Dean, 1988). IVN systems are limited in potential only by human constraints. Used creatively, the system can offer students a wider range of educational experiences than the institution, hindered by bricks and mortar, can possibly provide (Kitchen, 1988).

Description of Study

The purpose of this study was to ascertain the perceptions of secondary educators (instructors, principals, and superintendents) in the delivery of educational programs via interactive video networks (IVN). The objectives of this study are reflected in the following research questions:

1. What perceived level of understanding do educators have toward IVN?
2. What perceived level of interest do educators have toward using IVN?
3. What perceived obstacles exist preventing implementation of IVN education?
4. What programs are perceived as priorities for IVN delivery?

The population for the study included all instructors, principals, and superintendents employed in public secondary schools having an agricultural education program during the 1990-91 school year in a midwestern state. The entire population was sampled.

The survey instrument constructed for the purpose of this study was based on previous research conducted by Pullen (1989). Forty items within three parts of the instrument were examined for validity by a panel of experts. To determine the educators' self-reported level of understanding and interest in using IVN, a Likert-type scale (1-6) was utilized to define the levels. Six pilot sites that offer educational programs were selected from a neighboring state's schools. Analysis of instrument reliability confirmed that the instrument provided sufficiently reliable data, *r* = .91 using Cronbach's Coefficient alpha at the .05 alpha level.

Data were gathered through the use of direct-mail questionnaires. The overall response rate for the questionnaire was 81.4% (201 of 247). Measures of central tendency were calculated to ascertain the perceptions of educators toward the use of IVN in the delivery of educational programs. To determine if significant differences existed among groups, multivariate analysis of variance (MANOVA) procedures were used. Univariate analysis of variance (ANOVA) procedures were used to determine whether any univariate differences existed. An alpha level of .05 was used to ascertain significant differences.

Findings

A significant difference was found among educators in 6 of the 40 items dealing with level of understanding. Items in Table 1 were rank ordered with grand means (GM) ranging from 2.62 to 4.22. The rank order of items were similar for all groups. Educators' self-reported understandings were highest for the following items: (1) IVN GM = 4.22 and (6) cooperation necessary among schools who are using IVN GM = 3.87. Instructors' self-reported understanding of IVN were significantly lower on all items than the responses of superintendents. Lowest ranking items of all groups were (4) training in the use of IVN, GM = 2.68 and (5) teaching classes using IVN, GM = 2.62. The lowest ranking items indicate a lack of experience in IVN usage.

Table 1
Rankings of Educators' Self-Reported Understanding of Interactive Video Network

Survey Item #	Item		AEI	PR	SU	GM
1	IVN.	*M*	3.72	4.22	4.60	4.22
		SD	1.14	1.13	.96	1.12
6	Cooperation necessary among	*M*	3.13	3.76	4.53	3.87
	schools who are using IVN.	*SD*	1.61	1.51	1.22	1.54
3	Classes or programs using IVN.	*M*	3.15	3.89	4.17	3.78
		SD	1.31	1.21	1.28	1.33
2	Teaching methods used on IVN.	*M*	2.97	3.70	3.99	3.59
		SD	1.22	1.13	1.04	1.20
4	Training in the use of IVN.	*M*	2.28	2.71	2.96	2.68
		SD	1.28	1.36	1.43	1.38
5	Teaching classes using IVN.	*M*	2.17	2.75	2.87	2.62
		SD	1.34	1.54	1.56	1.52

Educators' Perceived Use of IVN as Students

The majority of educators, 75.6%, reported a willingness to participate on an IVN system as students. Lowest in ranking were principals (65.1%); highest in ranking were instructors at 85.0 percent. Results indicate that educators are willing to use IVN as students.

Educators' perceptions were not significantly different on eight survey items. Six of those eight items refer to financial resources. When finances are considered, educators indicate that they are in agreement. There is no indication, however, of agreement for the same reasons.

A significant difference existed among groups on 10 items (Table 2) focused on interest in using IVN. Educators' self-reported interest was strongest for the following items: (11) increasing the number of inservice programs for teachers, GM = 4.96; (9) offering continuing education for staff via IVN, GM = 4.95; and (12) encouraging the use of IVN by community, GM = 4.62. This self-reported interest is understood to indicate a desire to participate on IVN with their students. Instructors' third-ranked item, (14) committing time to become familiar with IVN, GM = 4.47, was ranked sixth out of the ten items as ranked by three groups of educators. Principals' third-ranked item, (8) receiving classes from other schools via IVN, GM = 4.40, was ranked seventh out of the ten items by the three groups of educators. Lowest ranking items included (7) offering classes to other schools via IVN, GM = 4.30; (16) promoting school board in using IVN, GM = 4.20; and (13) teaching others to use IVN, GM = 4.02.

Table 2
Rankings of Educators' Self-Reported Interest in Using Interactive Video Network

Survey Item #	Item		AEI	PR	SU	GM
11	Increasing the number of inservice programs for teachers.	*M*	4.65	4.83	5.31	4.96
		SD	1.04	1.20	.78	1.04
9	Offering continuing education for staff via IVN.	*M*	4.75	4.81	5.22	4.95
		SD	1.02	1.23	.83	1.04
12	Encouraging the use of IVN by community.	*M*	4.15	4.51	5.06	4.62
		SD	1.25	1.32	.86	1.20
10	Increasing the number of adult education programs.	*M*	4.33	4.54	4.86	4.60
		SD	1.10	1.24	1.07	1.15
15	Using IVN.	*M*	4.10	4.54	4.79	4.51
		SD	1.17	1.34	1.09	1.23
14	Committing time to become familiar with IVN.	*M*	4.17	4.41	4.76	4.47
		SD	1.04	1.32	1.08	1.17
8	Receiving classes from other schools via IVN.	*M*	3.62	4.57	4.86	4.40
		SD	1.30	1.33	1.03	1.32
7	Offering classes to other schools via IVN.	*M*	3.62	4.27	4.85	4.30
		SD	1.24	1.33	1.03	1.29
16	Promoting school board in using IVN.	*M*	3.58	4.32	4.59	4.20
		SD	1.33	1.41	1.14	1.35
13	Teaching others to use IVN.	*M*	3.63	3.95	4.37	4.02
		SD	1.40	1.59	1.29	1.45

AEI = Agricultural Education Instructor; PR = Principal; SU superintendent;

The four most frequently listed obstacles (Table 3) perceived as hindrances to successfully implementing IVN in rank order were: (a) costs; (b) negative attitudes of faculty, resistance to change, and "technophobia"; (c) selecting and training quality teachers for system; and (d) coordination of courses, time, schedules, and grading. Of all respondents, 70.6% reported cost as the highest-ranked obstacle to the successful implementation indicating one major reason IVN has not been used extensively. Negative attitudes of faculty, resistance to change, and "technophobia" were reported by 20% of the respondents and indicates a need for inservice to smooth the transition associated with change.

Table 3
Obstacles to Successful Implementation of IVN as Identified by All Survey Groups

Obstacles	Number Responding	%
Costs	142	70.6
Negative attitudes of faculty, resistance to change, "technophobia"	41	20.4
Selecting and training quality teachers for system	32	15.9
Coordination of courses, time, schedules, and grading	29	14.4

Educators' Perceived Use of IVN as Teachers

The majority of educators (72.6%) reported a willingness to participate on an IVN system as teachers. Least willing were principals (66.7%); most willing were superintendents (76.9%). Results indicate that educators are willing to use IVN as teachers.

The four most frequently listed priorities for use, table 4, of IVN included (a) high school courses--advanced math and science, business, computers, agriscience, foreign languages, history, social studies, geography, fine arts, writing, English, speech, and home economics courses; (b) teacher inservice and/or staff development; (c) adult and community programs; and (d) continuing education and post-graduate courses. High school courses were reported as a priority by 87% of educators, whereas teacher inservice and/or staff development was noted by 43% of the respondents, which may indicate the educators' desire to stay current on technology and offer currently unavailable courses to all schools. Adult and community programs were identified by 36%.

Table 4
Priorities Given to the Use of IVN as Identified by All Survey Groups

Priorities	Number Responding	%
High School:		
Advanced math and science, business, computers, agriscience, foreign languages, history, social studies, geography, fine arts, writing, English, speech, home economics, and required courses	174	86.6
Teacher inservice and/or staff development	86	42.8
Adult and community programs	72	35.8
Continuing education and post-graduate courses	22	10.9

On the following four survey items, instructors had a higher mean perception than either of the administrators: (22) likely be replaced by other technologies in the future, (33) require school to be a "provider" and receive little in return, (40) eliminate teaching positions, and (36) create a classroom shortage. Based on these negatively worded items, a more negative attitude toward the technology is exhibited by instructors than by principals or superintendents.

Conclusions and Recommendations

IVN is a relatively new technology, and educators have an unknown quantity of knowledge regarding the technology. The amount of knowledge of IVN among respondents was adequate to formulate meaningful perceptions of items presented in the instrument. Following are the major reported sources of information about IVN from highest to lowest: interactive video network systems in local schools and/or other sites (34.3%); demonstrations, workshops, personal observations, and/or telephone companies (32.8%); consortia, meetings, and the Department of Public Instruction (DPI) (28.9%); and magazines and journals (20.4%). Adequate knowledge of IVN was gained by educators to formulate meaningful perceptions toward the use of IVN.

Objective One

A significant difference was found among educators in all items in Section A of the survey instrument. Educators possess adequate understanding of IVN, cooperation necessary among schools who are using IVN, and classes or programs used on IVN. Educators possess least adequate understanding of teaching methods to be used on IVN, training in the use of IVN, and teaching classes using IVN. The items ranked lowest refer to the application of IVN and indicate a lack of experience in the actual use of IVN.

Objective Two

A significant difference existed among groups on all items. Educators' interest in IVN regarding inservice programs and continuing education for the school staff and community indicates a desire to gain more exposure to IVN by participating with the system from a student-type role. Educators' lack of interest in offering classes to other schools, promoting school board use, and teaching others to use IVN indicates a need for practice in using IVN to gain confidence.

Objective Three

The four most frequently listed obstacles perceived as hindering the successful implementation of IVN by rank order include costs; negative attitudes of faculty, resistance to change, and "technophobia"; selecting and training quality teachers for system; and coordinating courses, times, schedules, and grading. The fact that cost was considered an obstacle to the implementation of IVN, by greater than a three-to-one margin over the second-ranked obstacle, indicates a very evident reason why more schools have not implemented IVN. Negative attitudes of faculty and resistance to change indicate a need for inservice to smooth the transition associated with change.

Objective Four

High school courses were reported as a priority by 87% of educators, nearly two times the number of the second priority. Teacher inservice and/or staff development was ranked second in priority by 43% of the respondents. Adult and community programs were ranked third with 36% of educators indicating this as a priority. Educators' second highest ranking priority teacher inservice and/or staff development, may indicate a desire to stay current on technology and offer currently unavailable courses to all schools. Based upon the findings reported, the following conclusions have been formulated:

1. Educators accept IVN as appropriate technology for high schools.

2. Educators express interest in gaining more knowledge of IVN through inservice.

3. There is a perceived need for financial assistance in the start-up of IVN sites.

4. There is a need for inservice in educating instructors, principals, superintendents, and constituents of the school districts involved with IVN.

5. Rural America can deliver education to more students through the technology of IVN.

References

deBlas, D., Knox, J. E. G., McArthur, J. F., Wallace, M. S., & Dean, F. C. (1988). Two-way cable television: An instructional alternative for the future. Strategies and teaching techniques for honors and advanced placement (AP) foreign language instruction via two-way cable television. Rockville, MD: Montgomery County Public Schools, Dept. of Instructional Resources. (ERIC Document Reproduction Service No. ED 305 893)

Evans, J. (1988). Distance learning brings courses closer. School and College, 27(8), 16.

Hughes, A. L. (1988, April). The crisis of distance learning: A dangerous opportunity. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA. (ERIC Document Reproduction Service No. ED 304 128)

Kitchen, K. (1988). Interactive television at community colleges in Minnesota. The American Journal of Distance Education, 2(1), 73-76.

Kitchen, W. (1987, March). Education and telecommunications: Partners in progress. Testimony to the Senate Committee on Labor and Human Services. (ERIC Document Reproduction Service No. ED 282 551)

Mihalevich, J. R. (1990). Principal and teaching partner perceptions about clusters of quality instruction via satellite in Missouri public schools. Unpublished doctoral dissertation. University of Missouri-Columbia.

National Research Council. (1988). Understanding agriculture: New directions for education. Washington, DC: National Academy Press.

Pullen, D. H. (1989). Adoption of two-way telecommunications by schools in the Valley and Lakes Education District. Unpublished master's thesis. Fargo: North Dakota State University.

Whisler, J. S. (1988). Distance learning technologies: An aid to restructuring schools? Noteworthy. Aurora, CO: Mid-Continent Regional Education Laboratory, 28-42.

INTERACTIVE VIDEO NETWORK-EDUCATIONAL INSTRUCTIONAL METHODS

A Critique

Michael F. Burnett, Louisiana State University--Discussant

The researchers are commended for addressing a topic that is highly significant in the field of Agricultural Education as well as education in general. The introduction is well written and establishes the rationale for the study, and the purpose and objectives of the study are clearly stated.

Research procedures used in the study were appropriate and the researcher developed scaled instrument was found to be reliable which is evidence by a reported Cronbach's Coefficient alpha of a = .91. Selection of statistical tests was reported, and the alpha level established a' priori.

Questions that were raised as the paper was being reviewed include:

What is the meaning of the reference to the alpha level of the Cronbach's Coefficient alpha?

If, as the researcher reports, "The entire population was sampled," why were inferential statistics used? Even if one suggests that the 201 respondents comprised a sample of the population, it could not be interpreted to be a random sample.

Relatedly, what non-response follow-up procedures, if any, were used in the study? Although an 81.4% response rate is certainly a good return, the question still exists, could the nonrespondents have changed the results of the study if they were different from the respondents? It seems to this reviewer that 18.6% could have done that. Some attempt to assess the extent of this situation would have been appropriate. If an intensive follow-up was not feasible, at least a comparison of early and late respondents would have provided some small amount of evidence to support the generalizability of the data to the total group.

The researcher reported the used of MANOVA's and ANOVA's, but does not present any of the statistics in the findings. In fact, no further mention is made of the MANOVA results to even indicate if they were or were not significant.

Were the questions regarding willingness to participate in IVN asked of all groups? The findings reported an overall percent willing among two of the groups but not the third. Without a table on this information, it seems that the data for all three groups should have been presented in text.

Finally, what was the basis for concluding that, "the amount of knowledge of IVN among respondents was adequate to formulate meaningful perceptions of items presented in the instrument?" This seems an especially questionable conclusion in light of the researcher's preceding comment that, ". . . educators have an unknown quantity of knowledge regarding the technology."

THE EFFECTIVENESS OF COMPUTER-ASSISTED INSTRUCTION IN A LANDSCAPE PLANT USE COURSE

Mona R. Corbett, M. S.
Christine D. Townsend, Associate Professor
Jayne M. Zajicek, Associate Professor
Departments of Agricultural Education and Horticultural Sciences
Texas A&M University

Introduction

The computer is a tool used to supplement instruction and teach students. Bork (1985) stated that computers will become a dominant educational technique before the end of the twentieth century. Purchases of computers for classroom use have increased dramatically within the last decade (Becker & Shoup, 1985; Bork, 1985; Drazdowski, 1990; Schaad & Edfeldt, 1989). This growth suggests that computers are becoming a common educational tool in today's classroom.

Since the 1960s, computers were integrated into education for the purpose of Computer-Assisted Instruction (CAI). Typically, mainframe computers, minicomputers, or dumb-terminals were used for instruction in mathematics, English, science, and foreign language (Chen & Paisley, 1985; Hallsworth & Brebner, 1980). Today, with the increased availability of microcomputers and their introduction into many different areas of the curriculum, CAI has increased the instructional value of the computer.

Students possess many different learning styles, attitudes, experiences, and motivations. To teach each student effectively and efficiently, a variety of methods must be used to appeal to each student's learning strengths. CAI is one method that has been studied for both the effectiveness in teaching students subject content, and effectiveness in teaching students with different learning styles. Shepherd (1989), and Garcia, Uzzell, and Hubbard (1990) reported positive results from the use of CAI with at-risk learners. CAI provided students with individualized instruction at their level to adapt to their needs. McKeachie (1986) had reported earlier on the positive effects of the computer's ability to be programmed to operate at the student's level and provide individualized instruction. Other researchers found that CAI successfully presented new information to students in a self-contained and self-paced system (Hannafin & Peck, 1988).

Attitudes of students toward their learning environment play an important role in maintaining interest and motivating students. Although research on attitudes toward computers in education is limited, there are indications in other research that attitudes are important to the learning process (Bork, 1981; De Blassio & Bell, 1981). Therefore, if students enjoy what they are learning, they will pay more attention and learn more (Drazdowski, 1990).

Purpose and Objectives

In 1991, the Department of Horticultural Sciences at Texas A&M University introduced CAI into a landscape class and a plant identification/use class. As a part of the landscape program, students were required to learn how to use particular plants in appropriate growth environments. The question addressed by educators was, "Can computers, and more specifically the Plant Stax™ plant identification program, effectively teach students plant identification and use?" The purpose of the study was to determine the effectiveness of CAI in a course on identification and use of landscape plants.

Specific objectives to accomplish this purpose were to:

1. Compare cognitive knowledge gained among treatment groups,
2. Compare cognitive knowledge gained among learning style groups,
3. Compare attitudes toward computers among treatment groups, and
4. Determine the best combination of variables to predict post-test knowledge score.

Procedures

This study was conducted using a pre-test/post-test nonequivalent control group quasi-experimental design. The design consisted of two treatment groups and a control group. This system allowed for differential effects between the treatment groups and the control group to be identified.

Forty-three upper-level undergraduate students at Texas A&M University were involved in the study. These students were enrolled in the 1991 fall semester course, Horticulture 207 "Woody Ornamental Plants." During a fifteen week semester, all students were required to attend two one-hour lecture sessions and one two-hour laboratory session per week. During the lecture sessions, all students received the same plant identification instructor-lecture, -discussion, and -slide presentations. Selection of the laboratory section was part of class registration, and students were unaware of the different teaching treatments to be employed. Each laboratory section was randomly assigned a teaching treatment. In all treatments, students learned identification and use of a predetermined number of plants each week.

CONTROL GROUP. Students learned identification and use of plants via a traditional plant materials laboratory. The laboratory instructor met with the students to view and explain the use of the plant materials. They viewed live plant specimens in their natural environment on the campus or in a greenhouse. Students in this treatment group were allowed to study the specimens on their own time and schedule but were not provided instruction with the Plant Stax^{TM} program.

TREATMENT GROUP A. Students learned identification and use of plant material via CAI. The laboratory instructor met with the students for technical instruction on both the use of the computer system and identification and use of plant materials, but no live specimens were made available during the laboratory. Students were allowed to study using CAI and other resources they may have found on their own. No instruction was provided by the instructor outside of the CAI laboratory.

TREATMENT GROUP B. Students learned identification and use of plant material via live specimens and CAI. The laboratory instructor met with the students and presented live specimens with instruction about identification and use of that plant. Cultural information was then presented by computer instruction. Students were allowed to use the computer program and view live specimens during scheduled laboratory hours and on their own for study.

A commercial software program was used for the CAI. Plant Stax^{TX} was an Apple^{R} Macintosh^{TM} plant identification and description software program built on the HyperCard^{TM} version 2.0.2 platform. This program was developed to complement instruction in plant use and identification courses. The program consisted of a full page description of each plant and relevant graphics of that plant.

The instruments used to collect data were grouped into four parts: The pre-test, post-test, Kolb's (1986) Learning Style Inventory, and computer attitude inventory. The pre-/post-test consisted of nineteen multiple choice questions developed by the course instructor based on course objectives and common plant identification and use information. The Learning Style Inventory consisted of twelve sentence-completion items where students ranked sentence endings according to how they felt they learned best. Students were also asked to respond, using Likert-type responses, to an attitude inventory that consisted of twenty-one statements about computers. As suggested by Isaac and Michael (1990), instruments were distributed and completed during the time of regularly scheduled examinations of the lecture session when all the students of the various treatments met as one class.

Analysis of Data

The data collected from the administration of these instruments were analyzed using the program SPSS^{X} on the mainframe computer at Texas A&M University. Descriptive statistics were used to report characteristics of treatment groups, student learning styles, and attitudes toward computers. Frequencies, means, and standard deviations were reported where appropriate.

Although normally used in sample studies, inferential statistics were used for results of a time, place sample of students who enrolled in the course. The use of inferential statistics in this study was not an attempt to generalize the findings to all courses using CAI or students with particular learning styles or attitudes. However, it may be suggested that future courses and students may have characteristics similar to those found in this study.

Analysis of variance (ANOVA) was used to compare differences among the treatment groups for these categories. Correlation techniques were used to determine the relationships, if any, among and between treatment groups and variables. Regression analysis was used to determine the best combination of variables to obtain the highest cognitive knowledge gain.

Cronbach's coefficient alpha, a measure of internal consistency, was used to determine the reliability of the pre-test, post-test and a multi-item scale used for the attitude inventory. The pre-/post-test was developed and examined by the course instructor for content validity. It was developed based on course objectives and common plant identification and use information. The pre-test yielded a Cronbach's coefficient alpha of 0.53 and the post-test 0.44. These results revealed that individual items of the pre-/post-test instruments were not internally consistent. Item analysis should be performed to improve internal consistency in the future. The attitude inventory yielded a Cronbach's coefficient alpha of 0.84.

Results

Objective 1

When separated by treatment groups (plants only, CAI only, or both plants and CAI), no treatment group was significantly different from the other groups in the amount of plant identification knowledge possessed at the beginning and end of the study. Table 1 shows the pre-test and post-test scores and cognitive knowledge gained for each treatment group. Pre-test scores indicated that the students were homogeneous in their knowledge of plant materials at the beginning of the course. Post-test scores revealed that there was no significant difference among treatment groups in the amount of knowledge the students had gained by the end of the course. Therefore, CAI was just as effective in teaching plant identification as the other teaching methods. Scores for cognitive knowledge gained showed that there was no significant difference among treatment groups in the amount of knowledge gained. All teaching methods were equally successful in teaching plant identification.

Table 1
ANOVA on Pre-test and Post-test Scores When Grouped by Laboratory Treatment

	Plants Only n=17		CAI Only n=15		Plants & CAI n=11		F	F
	Mean	SD	Mean	SD	Mean	SD	ratio	Prob.
Pre-test	9.11	3.33	7.93	2.73	7.54	2.73	1.09	0.34
Post-test	14.52	2.18	13.73	2.57	13.81	2.13	0.55	0.57
Knowledge Gained	5.41	3.22	5.80	2.73	6.27	3.28	0.26	0.77

Objective 2

Based on the Learning Style Inventory, all students were classified into one of four learning styles, Diverger (learn by feeling), Assimilator (learn by watching), Converger (learn by thinking), or Accommodator (learn by doing). When students were grouped by these learning styles, an ANOVA showed that cognitive knowledge gained was significantly different at the 0.10 level (F=2.63, p=0.06). A Duncan's multiple range comparison test showed that students with Diverger (learn by feeling) and Assimilator (learn by watching) learning styles had a significantly higher cognitive knowledge score than students with a Converger (learn by thinking) learning style. Table 2 shows the difference in cognitive knowledge gained by learning style. This suggests that students who learn by "feeling" or "watching" may adapt to the memorization type work of plant identification and use easier than those students who learn best by "thinking."

Table 2
Difference in Cognitive Knowledge Gained by Learning Style.

Learning Style	n	Mean	Std Dev.	F ratio	F prob.
Converger	7	3.28 a	1.97	2.63	0.06
Accomodator	16	5.75 ab	3.02		
Assimilator	15	6.33 b	2.89		
Diverger	5	7.60 b	3.02		

[ab] Like letters denote means that are not significantly different at the $p<0.05$ level.

Objective 3

When separated by treatment groups (plants only, CAI only, or both plants and CAI), no treatment group was significantly different from the other groups in their attitudes toward computers (Table 3). It is important to note that the attitude inventory was administered after the treatment. Yet no significant difference was found among the different treatment groups in their attitudes toward computers where it was thought that the groups using CAI would have had different attitudes toward computers. Upon examination of responses for individual attitude statements, it was found that among the treatment groups there was no significant difference in the students' attitudes toward the use of computers in the Horticulture 207 course (Table 4).

Table 3
ANOVA on Attitudes Toward Computers Score When Grouped by Laboratory Treatment

	Plants Only n=17		CAI Only n=15		Plants & CAI n=11		F	F
	Mean	SD	Mean	SD	Mean	SD	ratio	Prob.
Attitude Score	3.37	0.46	3.28	0.59	3.45	0.33	0.38	0.68

1=strongly negative, 2=negative, 3=neutral, 4=positive, 5=positive, 6=strongly positive

Table 4
ANOVA on Attitude Variable HORTCLAS* by Laboratory Treatment

	Plants Only n=17		CAI Only n=15		Plants & CAI n=11		F	F
	Mean	SD	Mean	SD	Mean	SD	ratio	Prob.
HORTCLAS	3.18	0.95	3.20	1.08	3.00	0.89	0.15	0.86

*"Computers are helpful in learning material for Horticulture 207."
1=strongly negative, 2=negative, 3=neutral, 4=positive, 5=positive, 6=strongly positive

Further analysis of attitude statements for the class as a whole revealed that students had a positive attitude toward computers and their technical capabilities, ability to facilitate achievement and importance to the future. Students demonstrated a negative attitude when computers were compared to human characteristics, such as "Computers can make important decisions better than people." Table 5 shows the mean attitude scores of selected statements from the attitude toward computers inventory.

Table 5
Selected Statements: Attitudes Toward Computers Inventory (N = 43)

Selected Computer Attitudes	Mean	SD
I am amazed at what computers can do.	4.53	0.91
Computers make it possible to speed up scientific progress and achievement.	4.37	0.76
Computers are important to my future.	4.16	0.78
Computers are helpful in learning material for Hort 207	3.14	0.97
Computers make me feel that machines can be smarter than people.	2.02	1.01
Computers can think like human beings can think.	1.65	0.78
Computers can make important decisions better than people.	1.42	0.59

1=strongly disagree, 2=disagree, 3=don't know, 4=agree, 5=strongly agree

Objective 4

Post-test knowledge score was regressed on pre-test scores, attitudes toward computers, learning style, and treatment. Treatment group, as an independent variable, was dropped from the multiple regression equation because it failed to add appreciably to the explained variation. A reduced model would only include pre-test, learning style, and attitudes toward computers. This analysis explained 32.5% of the variation of post-test scores ($R^2 = .325$) (Table 6). Therefore, the best combination of variables to predict post-test knowledge scores were pre-test, learning style, and attitudes toward computers.

Table 6
Summary Table for Reduced Analysis of Regression

Source of Variation	DF	SS	MS	F	Signf. F
Regression	5	71.75	14.35	3.56	0.01
Residual	37	149.04	4.03		

$R^2 = 0.325$

Conclusions and Recommendations

Computers are being used for different applications in every aspect of life. There is now evidence that CAI can be used to teach students. Instructors should learn about computers and the applications of CAI and use this knowledge to their benefit. If an instructor can use computers to effectively supplement instruction, then the computer can become a valuable tool to the instructor. Using computers for instruction can help aid the teacher in more effective, teaching, lesson planning, and classroom management. Computers could be used to assist students as a study guide, provide make-up work, and demonstrate principles. Therefore, this may save the instructor valuable time and effort in preparing lessons. Development of new software is also needed to provide similar technology, and additional teaching methods for use in all instructional situations.

Based on the results of the Learning Style Inventory, each learning style was represented in the different treatment groups. Students who had the Diverger (learn by feeling) and Assimilator (learn by watching) learning styles had a significantly higher gain in cognitive knowledge than those students who had the Converger (learn by thinking) learning style. The fact that plant identification and knowledge of use are usually very visual skills may account for the higher scores of those students who learn by watching. Likewise, students who learn using the Diverger learning style, rely on learning from specific experiences, and feedback and discussion. These situations are a major part in the lessons of plant identification and use. On the other hand, students who have the Converger learning style learn better in more abstract situations using theory and logical analysis, more problem solving rather than memorization situations. The findings of this research and descriptions of the different learning styles reinforces the need for using a variety of teaching methods to meet the personal learning and academic needs of all students.

Although no treatment group was significantly different in their attitudes toward computers, students thought computers were "amazing machines" and they could be used to supplement instruction. Yet, students did not think that computers could make better decisions, think, and be smarter than human beings. This result indicates that a variety of teaching methods should be used to effectively teach all students.

Regression analysis showed that pre-test scores, learning style and attitude scores were the best predictors of post-test knowledge scores. This evidence suggests that instructors should pre-test students early in a course for previous knowledge and learning style and use the information to appropriately prepare lessons. Students with less knowledge early in the class could be provided with supplemental instruction, perhaps using CAI. Using this information, the instructor could also incorporate different teaching methods to accommodate for student characteristics such as learning style.

The findings of this study led the researcher to propose recommendations for additional research. Considering the small population used for this study, it is recommended that the study be repeated using a larger population. Findings from future research, using larger populations, will enable researchers to strengthen, or refute, the use CAI. Research efforts should continue using other horticultural courses and other courses within the field of agriculture. These studies will provide valuable information about new subject areas and how effective CAI can be to those instructional situations. Future research about CAI should be conducted using up-to-date software. This research was conducted with a program in which the graphics were line drawings of the plants. Employing more life-like graphics may have a significant effect upon the success of CAI.

References

Becker, W. J. & Shoup, W. D. (1985). The microcomputer as and instructional tool. The Journal of the American Association of Teacher Education in Agriculture, 26(2),65-72

Bork, A. (1985). Computers and information technology as a learning aid. Education-and-Computing, 1(1), 25-35.

Bork, A. (1981). Learning With Computers. Massachusetts: Digital Press.

Chen, M. & Paisley, W. (Eds.). (1985). Children and Microcomputers (pp. 9-16). Beverly Hills, California: Sage Publications.

De Blassio, J. K. & Bell, F. H. (1981). Attitudes toward computers in high school mathematics course. International Journal of Mathematical Education in Science and Technology. 12(1), 47-56.

Drazdowski, T. A. (1990). Computers in education--another failed technology? In M. M. Dupis & E. R. Fagan (Eds.), Teacher Education: Reflection and Change. The Pennsylvania State University. (Monograph 5), 2-16.

Garcia, S., Uzzell, G., & Hubbard, P. (1990). A Guide for Funding At-Risk Youth Programs: With Carl Perkins and Job Training Partnership Act Funds. Austin: Texas Education Agency.

Hallsworth, H. J. & Brebner, A. D. (1980). Computer assisted instruction in schools: Achievements, present developments, and projections for the future. Alberta, Canada: University of Calgary. (Eric Document Reproduction Service No. ED 200 187).

Hannafin, M. J. & Peck, K. L. (1988). The Design, Development, and Evaluation of Instructional Software. New York: Macmillan Publishing Company.

Isaac, S. & Michael, W. B. (1990). Handbook In Research and Evaluation (2nd Edition). San Diego, CA: EdITS.

Kolb, D. A. (1986). The Learning Style Inventory. Massachusetts: M^{c}Ber & Company.

McKeachie, W. J. (1986). Effective Strategies for Teaching Adults. Toronto: D. C. Heath and Company.

Schaad, D. C. & Edfeldt, R. D. (1989). Trends in medical student computing: Five years of entry data and subsequent performance in the basic sciences. In L. C. Kingsland III (Ed.), Proceedings of the 13th Annual Symposium on Computer Applications in Medical Care, (13)916-919.

Shepherd, R. (1989). Beginning with the learner: Strategies to individualize adult literacy programs. (ERIC Document Reproduction Service no. ED 313 584)

PREDICTORS OF TEACHERS' COMPUTER USE IN KOREAN VOCATIONAL AGRICULTURE HIGH SCHOOLS: A PROPOSED FRAMEWORK

A Critique

Michael F. Burnett, Louisiana State University--Discussant

The researchers are commended for the selection of what is clearly an important topic in the field of Agricultural Education in Korea. Research procedures utilized in the study were appropriate, well documented, and clearly described.

Of particular note is the well developed theoretical framework established for the study. This is especially important in accomplishing the task of moving the profession from studies that are exploratory in nature toward more explanatory or causal research.

It seems very desirable to have validated and pilot tested the measuring instruments in Korea rather than relying on data derived from previous studies in other settings. Also the comparison of respondents to nonrespondents using known characteristics is a very appropriate procedure in this study.

Some questions which were identified as the research report was reviewed included:

Would the report have been enhanced by a somewhat more thorough presentation of the descriptive findings of the study? For example, the research reports that, "Only three percent of the teachers felt no computer anxiety." This seems to be inadequate for the reader to understand the level of computer anxiety of the participants. Also, when the researchers reported that, "Only 31 percent of the teachers perceived that they could access school computers," does this refer to the issue of computer competence or availability?

Could the researchers have made specific suggestions for refinement of the proposed theoretical model? The researchers' recommendation that, "The theoretical framework for computer use . . . should be tested to determine if the framework is consistent in another group of teachers, "might have been more meaningful if more specific suggestions were provided for model refinement.

NAERM Fourth Session
1:30-3:00 p.m.
Concurrent Session K

Theme: FFA Contests and Awards, Agricultural Literacy, Integrating Math into Secondary Programs, and Attitudes of Cooperating Teachers Regarding Student Teaching Experiences

Topic 1: Integrating mathematics concepts into secondary agriculture programs

Speakers: Greg Miller (Iowa State University)
Joe Gliem (The Ohio State University)

Topic 2: Agricultural literacy assessment among educators in Missouri secondary schools that offer agricultural education programs

Speakers: Clark Harris (State Fair Community College)
Robert Birkenholz (University of Missouri)

Topic 3: Perceived value of FFA contests and awards by students and other adult groups

Speakers: Mark Blakely, Marilyn Holschuh (Synergy Research, Indianapolis)
Bob Seefeldt (National FFA Organization)
Glen Shinn (Clemson University)
Edward Smith (Oklahoma State Department of Education)
Paul Vaughn (Texas Tech University)

Topic 4: Differences in attitudes of agricultural education and other vocational education cooperating teachers regarding student teaching expectations

Speaker: Jim Flowers (North Carolina State University)

Discussant: David Doerfert (Iowa State University)

Chairperson: Jerry Peters (Purdue University)

Facilitator: Arthur Bell (North Carolina A&T University)

INTEGRATING MATHEMATICS CONCEPTS INTO SECONDARY AGRICULTURE PROGRAMS

Greg Miller
Assistant Professor
Agricultural Education and Studies
Iowa State University

Joe A. Gliem
Associate Professor
Agricultural Education and Engineering
The Ohio State University

Introduction

> If we want teachers of vocational agriculture to aid in dismantling the barriers separating general education from vocational education, we must equip present and prospective teachers with skills that enable them to see how English, mathematics, science, and other so-called academic courses are relevant to their interest and goals. (Warmbrod, 1974, p. 10)

Warmbrod's statement preceded an ever growing emphasis for change in vocational education. Over the last decade, several reformers have made consistent recommendations regarding vocational education. Some of these recommendations include: (1) the role of vocational education is to make youth employable, (2) employability can be accomplished when vocational education complements academic education, (3) academic and vocational education curricula should be integrated and their coequal importance recognized, and (4) students should see a connection between the academic skills they are required to learn and the world of work in which they will be required to apply those skills (Educational Testing Service, 1991; National Commission on Secondary Vocational Education, 1984; The Secretary's Commission on Achieving Necessary Skills, 1991; William T. Grant Foundation Commission on Work, Family, and Citizenship, 1988).

Vocational educators recognize the importance of academic proficiency to vocational students but are increasingly concerned that vocational students are not capable of transferring their academics skills to applied settings. Taba (1962) recognized that knowledge was not automatically transferred. Taba wrote that transfer "takes place only if there is some aid both in abstracting and applying the principle and in developing the method and the 'set' for so doing. This involves organizing the curriculum so that the principles of a subject stand out" (p. 125).

Most of the effort toward integrating academic and vocational education has come from vocational educators. Why is this so? Gray (1991) contended that without debate and reform, vocational education may cease to exist. From a more positive perspective, Pritz (1988) observed that employers expect their employees to apply basic math, science, communication, problem-solving, and decision making skills to specific tasks.

Should agricultural educators be concerned with integrating academic concepts into the curriculum and instruction of secondary agriculture programs? Buriak and Shinn (1991) developed an agenda for research in agricultural education which included the teaching of basic and academic skills as a research activity. Integration of basic and academic skills and infusion of science and mathematics into agricultural education were research objectives. Johnson (1991) provided support for studying the application of academic skills to agriculture. Johnson found that mathematics was highly related to success in the Mississippi agricultural mechanics contest and suggested that it may be necessary to design instructional programs to improve the mathematical problem-solving ability of agriculture students.

If the integration of academic material into agriculture curricula is important, what are the current attitudes of teachers? Teachers will ultimately determine whether or not integration takes place. Also, what measures are currently being taken to integrate mathematics into the secondary agriculture curriculum?

Purpose and Objectives

The primary purpose of this investigation was to describe vocational agriculture teachers' attitudes toward including mathematics concepts in the curriculum and instruction of secondary agriculture programs. The study further sought to describe efforts that were currently underway to integrate mathematics into the curriculum and instruction of secondary agriculture programs. The objectives were to:

1. Describe vocational agriculture teachers' attitude toward including mathematics concepts in the curriculum and instruction of secondary agriculture programs.

2. Determine whether or not vocational agriculture teachers' programs were actively engaged in applied academics (mathematics) as defined by the Ohio Department of Education, Division of Vocational and Career Education.

3. Determine whether or not vocational agriculture teachers work with mathematics teachers for the purpose of correlating mathematics and agriculture instruction in their respective schools.

4. Describe relationships between vocational agriculture teachers' attitude toward including mathematics concepts in the curriculum and instruction of agricultural education and selected background variables.

Procedures

The population consisted of all production agriculture teachers in Ohio (N=281). The Ohio Directory of Agricultural Education was used to develop a list of all production agriculture programs (N=255). Teachers from each program were invited to attend one of four sprayer calibration workshops held in different locations around the state. Questionnaires were administered during the workshops and background data were obtained from state teacher certification files and college of agriculture records. Teachers from 34 programs participated in the study for a 13.3% program participation rate and a 9% teacher participation rate.

Teachers who participated in the study were compared to representative samples of non-participants to determine if participants were similar to the population on background characteristics. Comparisons were made on the following characteristics; age, years of teaching experience, number of college mathematics courses completed, highest level of college mathematics coursework completed, ACT math score, and final college GPA. Only one significant difference was found. Participants had significantly higher final college GPA's than non-participants. Participants were similar to the population on background characteristics, however, extreme caution should be exercised in generalizing the results beyond the teachers studied.

The attitudinal instrument was developed by the researchers. The instrument was composed of 15 Likert-type items with response categories ranging from strongly disagree (1) to strongly agree (5). Content and face validity were assessed by a panel of experts consisting of faculty and graduate students in the Department of Agricultural Education at The Ohio State University. The instrument was field tested with a group of 18 secondary agriculture teachers not included in the sample. Cronbach's Alpha was used to assess the reliability of the instrument and yielded a coefficient of .87.

Analysis of Data

The data were analyzed using the SPSS/PC+ statistical package. Appropriate statistical procedures were utilized for description including frequencies, percents, means, standard deviations, and Pearson correlations. The alpha level was set a priori at .05, and Davis' (1971) descriptors were used to interpret all correlation coefficients.

Results

On a five point scale, agriculture teachers' attitude scores ranged from 3.67 to 5.00. Table 1 shows that 44.1% (15) of the teachers provided attitude scores greater than 4.50 (strongly agree). The distribution of attitude scores was negatively skewed with a mean of 4.47 (agree) and a standard deviation of .35.

Table 1
Agriculture Teachers' Attitude Toward Including Mathematics in the Curriculum and Instruction of Agricultural Education

Attitude Score	Frequency	Percent	Cum. %
3.51-3.75	1	2.9	2.9
3.76-4.00	4	11.8	14.7
4.01-4.25	2	5.9	20.6
4.26-4.50	12	35.3	55.9
4.51-4.75	4	11.8	67.6
4.76-5.00	11	32.3	100.0
Total	34	100.0	

Mean = 4.47 Std. Dev. = .35
Note. Based on scale: 1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; 5= strongly agree.

In order to better understand agriculture teachers' attitude toward including mathematics concepts in the curriculum and instruction of secondary agriculture programs, the level of agreement with each item on the attitude scale was examined. In response to positively worded items, teachers provided mean scores greater than 4.50 on the following statements; (1) students must understand basic mathematics to be successful with certain agricultural topics, (2) students learn more when they see a relationship between subjects (i.e. math and agriculture), (3) agriculture teachers should reinforce math skills, (4) agriculture courses provide an excellent vehicle for reinforcing math skills, (5) applying mathematics concepts to agriculture promotes higher level thinking in students (Table 2).

Negatively worded items were reverse coded as indicated in Table 2. Teachers provided mean scores greater than 4.50 on the following negatively worded items; (1) I refuse to teach applied math skills to agriculture students, and (2) I advise my students to avoid mathematics.

In response to state (Ohio Amended Substitute Senate Bill 140, Section 3313.901) and federal (Carl D. Perkins Vocational and Applied Technology Education Act, 1990, Title II, Part C, Section 235 B) legislation calling for the integration of vocational and academic education, the Ohio Department of Education, Division of Vocational and Career Education (1991) developed several applied academics programs. Ohio's applied academics programs operate on the premise that

Table 2
Means and Standard Deviations for Individual Items on the Attitude Scale

		Mean	S.D.
1.	Students must understand basic mathematics to be successful with certain agricultural topics.	4.79	.41
2.	I refuse to teach applied math skills to agriculture students.	4.76*	.50
3.	Students learn more when they can see a relationship between subjects (i.e. math and agriculture).	4.74	.45
4.	I advise my students to avoid mathematics.	4.71*	.46
5.	Agriculture teachers should reinforce math skills.	4.65	.49
6.	Agriculture courses provide an excellent vehicle for reinforcing math skills.	4.65	.49
7.	Applying mathematics concepts to agriculture promotes higher level thinking in students.	4.50	.51
8.	Teaching applied math to agriculture students is a good idea.	4.47	.51
9.	I enjoy using mathematics to solve agriculture related problems.	4.44	.56
10.	If more instructional materials for teaching mathematics applications in agriculture were available, I would not use them.	4.44*	.75
11.	In general I favor including mathematics concepts in the curriculum and instruction of agricultural education.	4.44	.56
12.	Students learn more when they are taught mathematics exclusively by a mathematics teacher.	4.26*	.83
13.	The Ohio Department of Education should develop instructional materials which address math applications in agriculture.	4.21	1.01
14.	Undergraduates in agricultural education should take only one college level course in mathematics.	3.97*	.94
15.	Vocational students need less instruction in math than those preparing to attend college.	3.94*	.78

* Denotes negatively worded items all of which were reverse coded.

certified academic instructors are best qualified to teach the academic components of vocational programs. For example, an applied academics (mathematics) program would require a certified mathematics teacher to provide math instruction that is correlated with the instruction received by students enrolled in vocational agriculture. According to the Action Plan for Accelerating the Modernization of Vocational Education in Ohio: Ohio's Future at Work (1990), applied academics (science, mathematics, and English/language arts) will be implemented in all secondary occupational programs by 1994.

Slightly more than 45% (15) of the agriculture teachers indicated that their programs were engaged in applied academics (mathematics) (Table 3). In order to determine the accuracy of the information, state vocational education documents were examined. These documents revealed that only 6% (2) of the programs represented in the study were engaged in applied academics (mathematics).

Agriculture teachers were asked to indicate whether on not mathematics teachers asked them for examples of agriculture related mathematics problems to be used as part of the regular instructional program in mathematics. Approximately 27% (9) of the agriculture teachers indicated that mathematics teachers did ask them for examples of agriculture related mathematics problems.

Table 3
Agriculture Programs Engaged in Applied Academics

Engaged in applied academics	Reported f	Reported %	Actual f	Actual %
Yes	15	45.5	2	6.0
No	18	54.5	32	94.0
Total	33	100.0	34	100.0

In addition, agriculture teachers were asked to indicate whether or not they consult with mathematics teachers regarding ways to incorporate mathematics skills into the agriculture instructional program. Approximately 47% (16) of the teachers did consult with mathematics teachers regarding ways to incorporate mathematics skills into the agriculture program.

Pearson correlations were calculated to describe relationships between selected background variables and agriculture teachers' attitude toward including mathematics concepts in the curriculum and instruction of secondary agriculture programs. The relationships between teachers' attitude and the number of college mathematics courses completed and final college grade point average were negligible. Low positive associations were found between teacher attitudes and age, years of teaching experience, and ACT math score. None of the relationships between agriculture teachers' attitude toward including mathematics concepts in the curriculum and instruction of secondary agriculture programs and the selected background variables were statistically significant (Table 4).

Table 4
Summary of Relationships Among Selected Variables and Agriculture Teachers' Attitude Toward Including Mathematics Concepts in the Curriculum and Instruction of Secondary Agriculture Programs

Variable	(X1) n=34	(X2) n=34	(X3) n=30	(X4) n=11	(X5) n=30	(Y1) n=34	Mean	S.D.
Age (X1)	1.00	.79*	-.12	.26	-.06	.15	38.24	8.86
Years Experience (X2)		1.00	-.02	.23	.07	.14	12.71	7.55
No. Math Courses (X3)			1.00	-.27	-.25	-.01	2.47	1.33
ACT Math Score (X4)				1.00	.04	.17	24.27	3.95
Final GPA (X5)					1.00	-.06	2.77	.39
Attitude (Y1)						1.00	4.47	.35

* $p < .05$

Conclusions and/or Recommendations

Participants in the study were compared to representative samples from the population of production agriculture teachers in Ohio and were similar to the population on background characteristics. However, the reader is reminded that the teachers participating in the study were not a probability sample of production agriculture teachers in Ohio. Therefore, statistically speaking, the results hold true for participants only.

All of the teachers participating in the study held positive to strongly positive attitudes toward including mathematics concepts in the curriculum and instruction of secondary agriculture programs. Similarly, Miller and Vogelzang (1983) found that vocational agriculture teachers in Iowa supported the inclusion of mathematics concepts in agricultural education. An analysis of responses to individual items on the attitude scale revealed that agriculture teachers believe that the integration of mathematics into agriculture curricula would provide both vocational and academic benefits to students. The findings of this study lend additional support to a growing consensus among vocational education leaders and educational reformers who encourage the integration of vocational and academic education.

The finding that 46% of the teachers' programs were engaged in applied academics (mathematics) was not supported by state vocational education documents. It was concluded that the agriculture teachers were not familiar with Ohio's applied academics programs. Administrators in the state office for vocational and career education should be alerted that 40% of the agriculture teachers in the study incorrectly indicated that their programs were engaged in applied academics (mathematics).

Approximately 27% of the agriculture teachers indicated that mathematics teachers asked them for examples of agricultural related mathematics problems to be used as part of the regular mathematics instructional program. Additionally, 47% of the agriculture teachers indicated that they consulted with mathematics teachers regarding ways to incorporate mathematics skills into the agriculture instructional program. It was concluded that some efforts were being made at the local level to correlate agriculture and mathematics instruction. Recently, Dormody (1992) found that a majority of agriculture and science teachers were sharing resources. Dormody's findings as well as the findings of the current study "do not support a rhetorical hypothesis, common in agricultural education, that secondary school teachers of agriculture are not interacting with other programs at their schools" (p. 29). Teacher educators should encourage present and prospective agriculture teachers to work collaboratively with mathematics teachers and teachers of other academic courses. Collaboration should focus on successful integration of vocational and academic education. Such collaboration will aid in closing the gap that often exists between vocational and academic programs.

Relationships between teachers' attitude toward including mathematics concepts in the curriculum and instruction of secondary agriculture programs and selected background variables ranged in magnitude from negligible to low and none were statistically significant. It was concluded that the relatively low and non-significant correlations were, in part, a function of the consistently positive attitude scores provided by the agriculture teachers.

The notion that mathematics concepts should be integrated into the secondary agriculture curriculum had considerable support among the teachers studied. The question that remains is how can this be done most effectively. Applied academics had reached very few of the agriculture programs represented, and approximately half of the agriculture teachers studied were not collaborating with mathematics teachers. Would it be reasonable to suggest that agriculture teachers be able to demonstrate to students the application of mathematics to agriculture related problems? Are current and prospective teachers prepared to engage in such an activity? Can agriculture teachers solve basic agriculture related mathematics problems? Research is needed to answer such questions.

References

Buriak, P. & Shinn, G. C. (1991). A structure for a research agenda for agricultural education: A national Delphi involving internal experts. Proceedings of the 18th Annual National Agricultural Education Research Meeting. Los Angeles, CA.

Davis, J. A. (1971). Elementary survey analysis. Englewood Cliffs, NJ: Prentice-Hall.

Dormody, T. J. (1992). Exploring resource sharing between secondary school teachers of agriculture and science departments nationally. Journal of Agricultural Education, 33(3), 23-31.

Educational Testing Service. (1990). From school to work. Princeton, NJ: Author.

Gray, K. (1991). Vocational education in high school: A modern phoenix? Phi Delta Kappan, 72(6), 437-445.

Johnson, D. M. (1991). Student achievement and factors related to achievement in a state agricultural mechanics contest. The Journal of Agricultural Education, 32(3), 23-28.

Miller, W. W. & Vogelzang, S. K. (1983). Importance of including mathematical concepts instruction as part of the vocational agriculture program of study. Ames: Iowa State University, Department of Agricultural Education.

National Commission on Secondary Vocational Education. (1984). The unfinished agenda (Information Series No. 289). Columbus, OH: The National Center for Research in Vocational Education.

Ohio Department of Education, Division of Vocational and Career Education. (1990). Action Plan for accelerating the modernization of vocational education in Ohio: Ohio's future at work. Columbus, OH.

Ohio Department of Education, Division of Vocational and Career Education. (1991). Applied academics: manual of operations for correlated academic programs. Columbus, OH.

Pritz, S. G. (1988). Basic skills: The new imperative. Vocational Education Journal, 63(2), 27-29.

Taba, H. (1962). Curriculum development: Theory and practice. New York: Harcourt, Brace & World.

The Secretary's Commission on Achieving Necessary Skills, U.S. Department of Labor. (1991). What work requires of schools: A SCANS report for America 2000. (Publication No. IBSN 0-16-035853-1). Washington, DC: U.S. Government Printing Office.

Warmbrod, J. R. (1974). The liberalization of vocational education. Paper presented at the annual meeting of the American Vocational Association, New Orleans, LA.

William T. Grant Foundation on Work, Family, and Citizenship. (1988). The forgotten half: Non-college youth in America. Washington, DC: William T. Grant Foundation.

INTEGRATING MATHEMATICS CONCEPTS INTO SECONDARY AGRICULTURE PROGRAMS

A Critique

David L. Doerfert, Iowa State University--Discussant

Agricultural education as a profession has shaped and refined a clear philosophy with several distinguishing tenets; one being the emphasis on the practical application and successful transfer of knowledge skills and attitudes into real-world settings (Phipps & Osborne 1988). We as a profession have continually professed that classroom leaning detached from meaningful context is reduced to a process of memorizing rules and isolated facts.

This belief, as recounted by the researchers, has been adopted by others in recent calls for education reform. This belief was also translated "into a requirement for federal funding as part of the Carl D. Perkins Vocational and Applied Technology Act of 1990 as it called for the integration of academic and vocational content." Each state, in compliance of the Act, has made efforts to integrate academic and vocational education.

The purpose of this investigation was to describe Ohio vocational agriculture teachers' attitudes towards integrating mathematics concepts in the curriculum and instruction of secondary agriculture programs. A researcher developed instrument was administered to 34 teachers who attended one of four sprayer calibration workshops throughout the state. Though the study was well-conducted methodologically, this sampling procedure resulted in a very small number of respondents for the study.

While the sample of the study was small and the results were generalized only to those who responded to the instrument, the data yielded a worthy point of discussion for the profession--that many secondary agriculture instructors believe they are integrating academic content into their agriculture coursework when in fact the State Department does not concur. As the profession continues to respond to the dynamic needs of the agriculture industry and the challenges put forth by the Understanding Agriculture report, careful consideration must be given to in-service needs. We cannot afford further misconceptions of our agricultural education programming.

The following commentary relates to this study and to the reporting of research findings in general. This investigation, as well as the majority of the profession's research, typically reflects the findings at a specific point in time. As a former State Supervisor, it would be difficult to consider the findings of this study as being generalizable to my state without first knowing whether Ohio was either ahead or behind my state in the implementation of the Carl Perkins Act. To facilitate the utilization of our profession's research results, we must make it a practice to more clearly describe a study's point in time to the reader and not limit the reporting of the time period to the demographic characteristics of the study's participants.

AGRICULTURAL LITERACY ASSESSMENT AMONG EDUCATORS IN MISSOURI SECONDARY SCHOOLS THAT OFFER AGRICULTURAL EDUCATION PROGRAMS

Clark Richard Harris
Director of Tech Prep
State Fair Community College
Sedalia, Missouri

Robert J. Birkenholz
Associate Professor
Agricultural Education
University of Missouri

Introduction

With each passing generation, most residents of this country have become one step further removed from direct ties to production agriculture. This sociological shift has resulted in a modification of the consuming public's view of policies which affect agriculture.

Most Americans had limited knowledge of the importance of agriculture in their lives and in the social and economic development of the United States (National Research Council, 1988). Much of the population's lack of understanding about agriculture has been caused by the movement away from farms and rural America and that agriculture was not included as part of the total educational experience of most young people. Caulder (1991) reported to the National Vocational Agricultural Teachers Association Conference that education about agriculture was important and should be provided for all students, not only those enrolled in vocational agriculture courses.

The National Research Council (1988) reported that knowledge about agriculture and its role in America should be systematically taught to students from kindergarten through the twelfth grade. The Council noted that much of the instruction should be implemented through existing programs in schools, rather than creating a separate class to teach about agriculture.

Educators in a variety of curricular areas are uniquely situated to teach about agriculture, use agricultural examples, or to provide leadership to infuse agricultural information in related areas. Educators utilize their experience and background as a context for their teaching. But, educators must be knowledgeable of the subjects and concepts they teach (Holmes Group, 1986). The lack of knowledge and understanding of agriculture would leave educators unprepared to use it as the context for instruction in the educator's subject area.

Frick (1991) reported that educators should be provided with in-service instruction related to appropriate methods which can be used to incorporate agricultural literacy concepts into specific curricular areas. In-service programs that enhance the agricultural knowledge base of teachers require much planning and should take the knowledge and attitude of the target audience into account.

Purpose and Objectives

The central purpose of this study was to assess secondary educators' knowledge and attitude about agriculture to allow for future in-service program planning. The following specific objectives were developed to guide the study:

1. To assess the knowledge level of secondary educators about agriculture.

2. To assess the attitude of secondary educators toward agriculture.

3. To determine the difference in the mean knowledge levels of secondary educators when classified by position.

4. To determine the difference in the mean attitude levels of secondary educators when classified by position.

Objectives three and four were converted to null hypotheses for statistical analysis purposes. The null hypotheses for this study were as follows:

HO_1: There is no significant difference in the mean agricultural knowledge levels among: (a) agriculture teachers, (b) language arts teachers, (c) mathematics teachers, (d) science teachers, (e) social science teachers, and (f) building administrators in schools offering secondary agricultural education programs in Missouri.

HO_2: There is no significant difference among the mean attitude toward agriculture levels among: (a) agriculture teachers, (b) language arts teachers, (c) mathematics teachers, (d) science teachers, (e) social science teachers, and (f) building administrators in schools offering secondary agricultural education programs in Missouri.

Procedures

This study utilized an ex-post facto design. The independent variable was the position of the educator respondents. The dependent variables were the mean scores produced from the knowledge and attitude sections of the Agricultural Awareness Survey, developed by Birkenholz, Case, Frick, Gardner, Schumacher, and Wallace (1991). The instrument was based on the eleven concept areas identified by Frick (1991); however, the eleven original concept areas were collapsed into seven areas for the purpose of instrument development.

The population for the study included all: (a) agriculture teachers, (b) language arts teachers, (c) mathematics teachers, (d) science teachers, (e) social science teachers, and (f) building administrators in the 245 Missouri secondary schools which offered agricultural education programs during the 1991-92 school year. The sample included educators from 200 randomly selected schools from the 245 schools included in the population. The educators included in the sample were purposefully selected clusters of educators. Each cluster included one randomly selected educator from each educator group comprising the population.

The sample was surveyed using the Agricultural Awareness Survey which consisted of three sections including 34 true/false knowledge statements, 34 five point Likert-type attitude statements, and demographic information. A pilot test, using 167 college students was conducted to clarify items on the instrument and to assess the statistical procedures.

The reliability of the knowledge section of the survey instrument was estimated at .65 using Kuder-Richardson 20 procedures. The reliability of the attitude section of the survey was assessed by computing a Cronbach's alpha coefficient of .78. The face validity of the revised instrument was assessed by a national panel of agricultural literacy experts.

A total of 1200 instruments, accompanied by cover letters and answer sheets were sent to randomly selected agriculture teachers at each of the 200 secondary schools included in the sample. The agriculture teachers were asked to distribute materials to each teacher identified in the cover letter as part of the sample cluster in each selected school. Follow-up postcards and telephone calls were used to improve the response rate.

Descriptive statistics including the computation of means and standard deviations were used to address objectives one and two. Null hypotheses HO_1 and HO_2 were tested using multivariate analysis of variance, followed by analysis of variance to identify differences among the respondent groups. Fisher's Least Significant Differences post hoc test was performed to determine where differences occurred among the respondent groups. The a priori alpha level was established at .05.

Results

Teachers from 146 of the 200 schools (73%) responded to the survey. Six hundred and sixteen of the 626 answer sheets returned were usable for the study. No significant difference was found between early and late respondents when ANOVA procedures were used to analyze the data to compare knowledge and attitude scores of early and late respondents, therefore the sample was judged to be representative of the population (Miller & Smith, 1983). The respondent group contained 59.2% males, with 96.8% of the respondents reporting white as their race classification.

Descriptive statistics, presented in Table 1, revealed that the mean knowledge scores ranged from a high mean score of 31.59 from agriculture teachers, to a low mean score of 28.04 from language arts teachers, with the highest possible mean score being 34. Mean attitude scores ranged from a high mean score of 142.410 from agriculture teachers, to a low mean score of 128.717 from language arts and mathematics teachers.

Table 1
Knowledge and Attitude Mean Scores by Respondent Group

	Knowledge scores*		Attitude scores**	
Group	M	SD	M	SD
Agriculture teachers	31.590	1.848	142.410	9.300
Language arts teachers	28.042	3.339	128.717	11.270
Mathematics teachers	28.212	3.619	128.717	10.577
Science teachers	29.673	2.218	129.879	9.422
Social science teachers	29.225	2.978	131.451	9.729
Administrators	29.659	2.705	131.736	10.561
Total	29.269	3.107	131.662	11.094

* The maximum score on the knowledge portion was 34 and minimum score was 0.

** The most positive attitude score possible was 170, and the most negative attitude score possible was 34.

The significance of the knowledge scores tested using the MANOVA procedure were examined by computing a Pillai's Trace, which produced an F value of 14.766, with a significance of $p = .0001$. The MANOVA procedure was followed by an ANOVA, which is presented in Table 2. The ANOVA procedure produced an F value of 18.61, which was significant at the $p = .0001$ level. Therefore the first null hypothesis was rejected.

It was found, by use of Fisher's Least Significant Differences post hoc test, that the agriculture teacher group was the only group to significantly differ from all other groups. Agriculture teachers produced significantly higher mean knowledge scores than all other educator groups. Mathematics and language arts teachers differed from the other groups, but did not differ significantly from each other. Mathematics and language arts teachers produced significantly lower mean knowledge scores than all other educator groups. The Fisher's LSD post hoc test results are presented in Table 3.

The attitude scores were tested with the MANOVA procedure by calculating the Pillai's Trace value. The MANOVA produced an F value of 14.766 and a significance level of $p = .0001$.

Table 2
ANOVA for Knowledge Scores by Respondent Group

Source	df	F	p
Main effect (group)	5	18.61	.0001*
Error	610		
Total	615		

MANOVA test result for HO_1: No group effect, Pillai's Trace = 0.216, $F = 14.77$, $p < .0001$

Table 3
Fisher's Least Significant Difference Test Among Respondent Groups for Knowledge Scores

Group		Groups				
	M	B	C	D	E	F
A. Agriculture teachers	31.590	.0001*	.0001*	.0001*	.0001*	.0001*
B. Language arts teachers	28.042		.6541	.0001*	.0026*	.0001*
C. Mathematics teachers	28.212			.0002*	.0109*	.0004*
D. Science teachers	29.673				.2663	.9739
E. Social science teachers	29.225					.3008
F. Administrators	29.659					

* Significant at the .05 level

The MANOVA procedure was followed by ANOVA, which revealed significant differences among the secondary educator groups' mean attitude toward agriculture scores. The ANOVA test yielded a significant F value of 22.88 and a $p = .0001$, as presented in Table 4. Therefore, the second null hypothesis was rejected. Fisher's LSD post hoc test, presented in Table 5, revealed that the agriculture teacher group had the most positive mean attitude score, at 142.410, and was significantly different than all other groups of educators. Language arts teachers were significantly different than social science teachers. Language arts and mathematics teachers were significantly different than administrators. In both cases, language arts and mathematics teachers produced less positive attitude toward agriculture scores.

Table 4
ANOVA for Attitude Scores by Respondent Group

Source	df	F	p
Main effect (group)	5	22.88	.0001*
Error	610		
Total	615		

MANOVA test result for HO_2: No group effect, Pillai's Trace = 0.216, $F = 14.77$, $p < .0001$

Table 5

Fisher's Least Significant Difference Test Among Respondent Groups for Attitude Scores

Group	M	Groups				
		B	C	D	E	F
A. Agriculture teachers	142.410	.0001*	.0001*	.0001*	.0001*	.0001*
B. Language arts teachers	128.717		.9999	.3930	.0475*	.0340*
C. Mathematics teachers	128.717			.3999	.0506	.0364*
D. Science teachers	129.879				.2667	.2030
E. Social science teachers	131.451					.8466
F. Administrators	131.736					

* Significant at the .05 level

Following the analysis of the data collected in this study, the following major findings were observed:

1. Agriculture teachers produced higher mean knowledge about agriculture scores and had less variance associated with those scores than all other respondent groups.

2. Agriculture teachers produced more positive mean attitude toward agriculture scores and had less variance associated with those scores than all other respondent groups.

3. Language arts and mathematics teachers produced the lowest mean knowledge scores and the least positive attitude toward agriculture scores.

4. Generally an inverse relationship existed between the knowledge scores and the variance associated with the scores; the lower the knowledge scores, the higher the standard deviation.

Conclusions and Recommendations

Based on the findings of this study, contingent upon limitations and assumptions, the following conclusions were generalized to the population.

It is important to know that secondary educators are somewhat knowledgeable about agriculture and that they have a positive attitude toward agriculture. This would suggest that in-service programs directed at agricultural literacy should be provided to educators, not in technical agriculture, but to help them identify strategies for applying agricultural examples in their curriculum areas.

It is also important for agricultural educators to know that agriculture teachers have a greater knowledge about and a more positive attitude toward agriculture than other secondary educators. The greater knowledge of agriculture teachers should be utilized as consultants to aid in the incorporation of agricultural examples throughout the curriculum of local schools. Agricultural educators can provide local examples of applied learning to all disciplines in the school.

Language arts and mathematics teachers have a lower agricultural knowledge level and would be less inclined to include agricultural examples in their classes. This suggests that extra effort should be directed at language arts and mathematics teachers to instill a greater level of confidence in using agricultural examples.

Pre-service courses to assist students in identifying strategies for applying agricultural examples to academic disciplines should be offered to students preparing to become academic teachers.

References

Birkenholz, R. J., Case, D., Frick, M. J., Gardner, H., Schumacher, L. G. & Wallace, D. (1991). Agricultural awareness survey.

Caulder, J. (1991). Classroom of the future. Keynote presentation at the National Vocational Agriculture Teacher Association National Convention, Los Angeles, CA.

Frick, M. J. (1991). A definition and the concepts of agricultural literacy: A national study [Doctoral dissertation, Iowa State University, 1990]. Dissertation Abstracts International, 51, 2244A.

Holmes Group, The. (1986). Tomorrow's teachers. East Lansing, MI: Holmes Group.

Miller, L. E., & Smith, K. L. (1983). Handling nonresponse issues. Journal of Extension, 21(5), 45-50.

National Research Council, Board on Agriculture, Committee on Agricultural Education in Secondary Education. (1988). Understanding agriculture: New directions for education. Washington, DC: National Academy Press.

AGRICULTURAL LITERACY ASSESSMENT AMONG EDUCATORS IN MISSOURI SECONDARY SCHOOLS THAT OFFER AGRICULTURAL EDUCATION PROGRAMS

A Critique

David L. Doerfert, Iowa State University--Discussant

Spurred by the challenge of the Committee on Agricultural Education in Secondary Schools' report (1988) that "all students should receive some systematic instruction about agriculture," members of the Agricultural Education profession have worked diligently to define, instruct and assess the agricultural knowledge level of the general public. This investigation has continued this work.

The purpose of this study was to assess secondary educators' knowledge and attitude about agriculture. The population for the study included teachers of agriculture, language arts, mathematics, science, and social science as well as building administrators in Missouri's secondary schools. The researchers are to be commended for their careful attention to sampling procedures and research methodologies.

One detail omitted from the manuscript was how the instrument was administered. Did respondents have the opportunity to search reference materials to complete the instrument or were they asked to utilize only their personally-stored knowledge? If the former is the correct response, did this study truly measure agriculture literacy or did it measure the quality and quantity of agriculture reference materials.

The researchers stated in their Conclusions and Recommendations section of the manuscript that language arts and mathematics teachers would be less inclined to integrate agriculture examples into their instruction. While the results do support that these teachers do have a lower, less positive attitude toward agriculture, the data do not support the contention that these teachers would not make the effort to include agriculture examples. Other factors, such as administrative directive, may overcome negative attitudes.

To stimulate discussion in this NAERM session, I would raise the following question: "How significant are these findings?" The range of the means of the Knowledge score was 3.538 (with 34 being the top score) and the range of the Attitude score was 13.693 (out of 170 possible). If we were make this analogous to the secondary agriculture classroom, it would be the farm-raised student getting an "A" on the production-related test with the non-farm, urban student receiving a "B." Are the results of this study worthy of making changes in current programming or was the significance of the findings merely a result of the large sample size?

PERCEIVED VALUE OF FFA CONTESTS AND AWARDS BY STUDENTS AND OTHER ADULT GROUPS

Mark Blakely and Marilyn Holschuh, Senergy Research
Bob Seefeldt, National FFA Center
Glen Shinn, Texas A&M University
Edward Smith, Oklahoma Department of Vocational-Technical Education
Paul Vaughn, Texas Tech University

Introduction

Agricultural education is a pragmatic curriculum that uses multiple educational methodologies to develop the whole person: classroom and laboratory instruction, leadership, and supervised agricultural experience. The curriculum recognizes the need to provide purposeful experiences. In an analysis of the national High School And Beyond educational data base, Camp (1989) concluded that there was a direct and positive casual relationship between student participation and achievement.

One of the six original educational objectives was to develop the abilities to exercise effective leadership in fulfilling occupational, social, and civic responsibilities (USDE, 1976). Leadership experiences have largely been delivered through the FFA Organization. Vaughn (1977) observed that FFA is the only co-curricular activity in a public school system that is considered an intracurricular, rather than an extracurricular activity. Bakar and McCracken (1993) found participation in FFA correlated positively with career maturity. Carter and Townsend (1983) reported that leadership traits were enhanced with vocational agriculture and FFA experiences. Weber (1991) found contest experiences contributed to student decision-making skills and developing self-confidence. Because contests and awards have been an integral part of the curriculum, periodic review is needed to corroborate the needs of customers including FFA members, parents, teacher/advisors, school administrators, and state agricultural education staff.

Students are customers of agricultural education who recognize quality and value. When provided an opportunity to shape their educational experiences, students generally make wise decisions based on their perceived needs. Rudolph and Yoder (1987) found student aspirations were a factor which explained student success. Marshall, Herring, and Briers (1990) concluded that students enroll in agricultural science because of characteristics of the class and because it enhances their identity as a person. Students join FFA because it enhances their identity as a person. Marshall, Herring, and Briers found students join FFA to become involved in its activities. Shinn and Buriak (1988) observed that the goal of the national FFA contest committee was to provide a capstone experience to a quality instructional program and give rise to aspirations of future agricultural leaders. Shinn and Buriak concluded that there was a strong correlation between the goals of the contest committee and the goals of the students who participated.

Adults are concerned about the quality and value of educational programs for students. Parents, teachers, and state agricultural education state staff members want to help organize experiences that will meet the needs of students while accomplishing the purposes of agricultural education. Elliot and O'Connell (1990) reported Michigan Delphi participants strongly agreed that leadership contests were excellent motivational tools that develop life-long skills. The Michigan participants also agreed that contests and awards should be created for non-traditional students.

This inquiry was focused around the curriculum design principles of Tyler (1951) who asked (1) what are the purposes of the curriculum; (2) what activities contribute to achievement; and (3) how do you organize the activities to achieve the intended purposes?

Purpose and Objectives

The purpose of this research was to identify the value of FFA contests and awards and compare those values to those held by adults. The research objectives were to determine: (1) variables which affect decisions to enroll in agricultural education classes; (2) connections between enrollment and participation in contests and awards; (3) relationships between school drop-out and contests and awards; (4) barriers to participation in the contests and awards programs; and (5) relationship of competition and cooperation and the value of recognition.

Procedures

Qualitative Research

A series of conference calls in October 1992 among the researchers identified relevant goals and objectives, finalized process details and began development of focus group guidelines. Twenty purposive focus groups were conducted in seven locations throughout the United States. Separate focus groups were organized with students and adults, including parents, advisors, and school administrators. The purpose of this qualitative phase was to define key issues surrounding the attitudes and values about the (1) appropriate experiences which encourage personal development; (2) roles that activities play within the school setting; and (3) value placed on participation, competition, cooperation and meaningful recognition.

Quantitative Research

Mail and telephone interviews were structured to quantify key issues identified by the focus groups. The Total Design Method developed by Dillman (1978) was used to structure the survey. A nationally stratified random sample of 1,680 FFA members, advisors, parents, administrators, and state staff were mailed the instrument. A completion rate of 773 surveys (46%) was realized from the mail survey. An additional 114 phone surveys were completed to generate response rates within each of the population subgroups adequate to insure statistical validity. A total of 887 surveys were completed for a 52% return rate. There were no statistical differences in the responses of those who responded to the mail or telephone survey.

Analysis of Data

Statement values ranged from 1 (not important) to 10 (very important). An *a priori* decision set the mean acceptance value at 5.5 (somewhat important). The confidence value was set *a priori* at $p > .10$. ANOVA was used to determine if significant differences occurred within or between groups. Differences within the student subgroup were examined based on gender, minority or non-minority, and whether they were from farm/ranch, rural non-farm, or urban/suburban backgrounds. Differences within advisor and parent sub-groups were examined based on the same three background categories. The mean value of each group was reported as a pair (mean of group 1/group 2). Items which provided multiple responses were reported as a percentage. Chi square was used to determine when significant relationships occurred within groups. The percentage of each group was reported as a set (percentage of group 1/group 2, etc.).

Results

- Which variables affected enrollment decisions in secondary agricultural education classes? Students enrolled because they wanted to participate in FFA activities (7.8), enjoy working outside the classroom (7.5), plan on going into a career in agricultural industry (7.4), are interested in pursuing scholarships (6.7), and have friends in the program (5.9). There were significant differences among students and adults. When making enrollment decisions, students did not rate the items "like the teacher" or "friends are in the program" as high as adults. In general, students believe counselors were one of the least important factors (3.1) in placing them in agricultural education classes. Advisors and state staff rated counselors significantly more important than did students (4.6/4.6/3.1). Advisors from farm or ranch backgrounds rated participation in FFA activities (7.9) significantly higher than advisors from urban (7.2) and advisors from rural non-farm backgrounds (6.8).

Students are more likely **not** to enroll because of scheduling problems (7.1), parents don't understand and/or support their enrollment (6.1) and they do not like the "farmer" stereotype (6.0). Advisors and state staff placed a significantly higher value than did students on each of the three factors. Counselors were not an important reason students do **not** enroll in agriculture classes; however, there were significant differences between the values assigned by students and adults. Students did **not** perceive counselors as discouraging them from enrolling (3.8), although adults consistently perceived counselors more likely to advise students not to enroll. This was strongest among state staff (8.5), advisors (6.2), parents (5.1) and administrators (4.6). Parents from a farm or ranch background placed significantly higher values on the concern that agriculture does not fit into the students' class schedules because they are taking college prep classes (7.5) than parents from urban backgrounds (6.7) and parents from rural non-farm backgrounds (6.4). Overall, advisors and state staff rated the lack of parent understanding as an important reason why students do not enroll in agriculture (7.1/8.0).

What were the connections between enrollment and participation in contests and awards? Students participated in contests and awards because they liked the feeling of winning and self esteem (8.1), hoped to win prizes or scholarships (8.0), liked to go on trips (7.7), enjoyed teamwork (7.6), and learned from the preparation for contests and awards (7.1). The three highest factors rated by students were also rated highest by all adult groups. Parents were consistently higher than other adults on all important reasons students participate except the value of going on trips. Advisors with a rural non-farm background rated "ag teacher makes them participate" significantly higher (5.1) than urban advisors (4.1) and advisors with farm or ranch backgrounds (4.2). Parents with a rural non-farm background rated this factor lower (3.9) than parents from farm or ranch backgrounds (4.6) or urban parents (5.3).

Students felt learning objectives were important outcomes of contests and awards. Teamwork and responsibility were the highest rated items among all variables which explained the value of contests and awards. From a list of life skills, students rated teamwork (8.5), responsibility for a project (8.4), learning an area of knowledge (7.7), competing with others (7.5), talking in front of people (7.4), learning a specific skill (7.0), and learning to win (6.2) in descending order. Responsibility (8.7) and teamwork (8.5) were rated highest by all groups while learning a specific skill (7.0) and learning to win (5.3) were rated lowest by all groups. Parents valued responsibility, teamwork, communications, learning to compete, and learning a specific skill significantly higher than other adult groups. Advisors with rural non-farm backgrounds valued responsibility lower (8.1) than those from farm/ranch (8.5) or urban backgrounds (8.7). Advisors from rural non-farm backgrounds valued teamwork significantly lower (7.9) than those from farm/ranch (8.3) or urban (8.7) backgrounds.

Eighty-two percent of the students favored enrollment as a condition of participation while seventeen percent did **not** believe they should be required to enroll to participate. A majority of students (58.7%) favored regular enrollment while 11.1% favored independent study and 10.3% would require the first year enrollment followed by independent study.

The most commonly perceived benefit to enrollment was that FFA and class activities were too intertwined to separate (32.6%). Other perceived benefits included classroom instruction as an aid in learning (28.4%), and enrollment maintains members' interest (19.4%). Students rated contact with other students and keeping members' interests higher than did adults. Advisors (50.0%), state staff (47.9%) and administrators (40.7%) felt the greatest benefit of enrollment was that FFA and classwork cannot be separated. Parents, administrators, and state staff valued classroom instruction higher than advisors. There was a significant difference between advisors with a rural non-farm background rating classroom instruction lower (16.2%) than those with urban (26.5%) or farm or ranch (28.4%) backgrounds.

Nearly two-thirds (65.1%) of the students indicated that current contests and awards are equally motivating for students interested in a broader area of agricultural industry, but not interested in production agriculture. Significant differences were found among parents, advisors, administrators, state staff, and students in the value of motivation for those **not** interested in production agriculture. Parents and students indicated current contests and awards were equally motivating (65.9/65.1%). State staff, administrators, and advisors (74.0/46.7/45.8%) reported the current contests and awards were **not** equally motivating and there was an increased need for contests and awards programs in non-production areas.

The adult sub-groups selected self-confidence as the most positive outcome followed by teamwork, recognition, developing citizenship, and motivating students to learn. Adults identified a lack of recognition for non-winners as the most negative outcome with "too much emphasis on winning," and "limiting the number of students who can compete" as other negative outcomes.

What was the perceived relationship between school drop-outs and contests and awards? Students agreed contests and awards were an incentive for them to stay in school (56.7%) while 7.1% of students perceived that contests and awards do **not** provide encouragement to remain in school; 36.1% were not sure about the relationship. More parents, advisors, administrators, and state staff felt contests and awards were an incentive to stay in school (72.8/66.3/70.4/67.1%) than did students (56.7%). There was a significant difference among state staff, advisors, parent, and administrators (26.0/25.3/20.8/18.6%) who indicated "not sure." Students reported contests and awards provide motivation for improvement for many or most students (52.4/34.9%). They responded most often that their FFA chapter was like a group of friends (45.2%). Twenty-four percent of the students reported the FFA chapter was like family and 15.5% reported the FFA chapter was made up of people with common interests.

What were the perceived barriers to participation in contests and awards programs? Students reported that involvement in other school activities (6.7), work after school (6.5), shyness (6.2), conflicts with part-time jobs (6.0), and a feeling that they don't fit (5.8) were barriers that reduce participation. Students with farm & ranch backgrounds were less concerned about lack of transportation (4.5) than urban students (5.4) or students from rural non-farm backgrounds (5.6). Male students were significantly less concerned about the lack of transportation (4.9) than female students (5.6). Students with farm & ranch backgrounds valued work after school lower (5.9) than rural non-farm (6.8) or urban students (6.8) and school activities (6.3/7.0) lower than other students. Students with an urban or suburban background were more likely to feel they don't fit (6.7) than those from farm & ranch (5.4) or rural non-farm backgrounds (5.7). There were significant differences among groups regarding the importance of barriers with the exception of too much paperwork. State staff rated the importance of the top five barriers higher than other adult groups.

What were the values of competition, cooperation, and recognition to students and adults? A majority of all groups (76.2%) rated cooperation as being more important than competition. Cooperation was rated higher by parents (80.9%), state staff (79.4%) and advisors (74.7%) than did students (71.0%). However, among parents, significant differences occurred depending upon background. Those parents from rural, non-farm backgrounds rated cooperation higher (89.8%) than those with urban backgrounds (62.5%).

Students recommended that all students should be recognized for participating at the first level above the local Chapter (8.3). Students also recommended state and national competitors should receive special recognition by groups (8.2), all students should be recognized for participating in state and national competition (8.1), competition should be by levels (7.8), students should know where they rank (7.4), and only top students deserve special recognition at the state and national level (6.2). Significant differences occurred between the groups on five of the six methods of recognition. Advisors with a farm or ranch background placed less value on recognition by levels (6.7) than did advisors from rural non-farm (7.4) or urban (8.3) backgrounds. Advisors with urban or suburban backgrounds placed significantly higher value on recognition for participating at the first level above the chapter (8.6) than did advisors from rural non-farm (7.3) or from farm or ranch (7.0) backgrounds. Among the adult group, parents placed higher value on recognition for competition by levels (8.4), all national competitors (8.2), and recognition for all above the local level (8.1). Advisors valued knowing where students ranked within the group significantly higher than other adult groups.

The most important forms of recognition to motivate a student to participate and achieve in contests were to provide plaques or trophies (8.4), articles in local newspapers (8.2), local awards banquets (8.1) and recognition from friends and family (7.9). Although the relative importance varied slightly, all were highly rated by each of the five groups (8.5 to 7.2). Advisors from urban backgrounds rated school announcements (8.1/6.8/6.7), certificates (7.9/6.8/7.2), and friends and family (9.1/8.4/8.4) as being more important forms of recognition than did advisors from farm/ranch or rural non-farm backgrounds. Advisors from farm & ranch backgrounds rated cash awards (6.8/7.3/7.8) lower than did other advisors. Parents from an urban or suburban background rated medals or patches more important (9.2) than did other parents (8.0/8.0).

Conclusions and Recommendations

Although significant differences occurred among students and adults, all groups generally valued the contributions of contests and awards as a tool to enhance achievement and encourage participation. Students enrolled in agricultural education because they valued cooperative learning about broad careers. They recognized the relationships between enrollment and participation in FFA contests and awards. Students also recognized a positive relationship between staying in school and active participation in contests and awards. Teamwork and cooperation were valued by both students and adults.

Barriers to enrollment and participation included scheduling, parental support, and negative stereotypes. Students and adults valued cooperation and recommended increased cooperative activities in contests and awards. The primary goal of contests and awards should be to enhance leadership, personal growth, and career development. Activities should be designed to foster fairness and cooperation. These conclusions provided a basis for recommendations for contests and awards as an educational tool to enhance learning. Contests and awards should include individual, team, and large group activities.

Individual member activities should be designed to (1) provide opportunities for developing responsibility, self confidence, feelings of worth and leadership; (2) provide accessibility to students; (3) provide for multiple levels of participation and experiences; (4) provide recognition to all participants; (5) provide a balance of experiences inside and outside the classroom; (6) organize experiences which expose students to broadly defined career opportunities; (7) encourage problems solving and communications skills; and (8) be an outgrowth of the instructional program.

In addition, team activities should recognize the experiences and aspirations of the individual member while (1) including cooperative activities; (2) including problem solving and critical thinking; (3) reducing barriers to participation; (4) encouraging broad participation and recognize excellence within levels of experience and ability; and (5) providing local recognition for performance at all levels of participation.

Successful large group activities should be inclusive and provide: (1) a balance of experiences inside and outside the classroom with sensitivity for challenged members; (2) opportunities for developing self-confidence, responsibility, citizenship, cooperation, and feelings of worth; (3) hands-on activities with multiple levels of participation and experiences related to food, agriculture, and natural resources careers.

References

Bakar, A. & McCracken, J. (1993). FFA and SAE participation as predictors of the career maturity of secondary agricultural education students. Proceedings of the 47th Annual Central States Agricultural Education Research Conference. Chicago, IL.

Camp. W. (1989). Participation in a study of activities and achievement: a co-variance structures analysis. Staff Study. Blacksburg, VA: Virginia Polytechnic Institute and State University.

Carter, R. & Townsend, C. (1983). The relationship of participation in FFA activities and leadership, citizenship, and cooperation. Journal of the American Association of Teacher Educators in Agriculture, 24 (1).

Connors, J., Elliot, J., & Moore. E. (1990). Factors influencing secondary Michigan agriculture students about membership in the FFA. East Lansing: Michigan State University.

Dillman, D. (1978). Mail and telephone surveys: The total design method. New York: John Wiley & Sons, Inc.

Elliot, J. & O'Connell, T. (1990). Michigan agriscience and natural resources education: Delphi study on FFA issues. Staff Study. East Lansing: Michigan State University.

Marshall, T., Herring, D., & Briers, G. (1990). Analysis of enrollment in agricultural science and membership in the FFA in Texas. Proceedings of the 17th Annual National Agricultural Education Research Meeting. Cincinnati, OH.

U. S. Office of Education (1976). Objectives for Vocational-Technical Education in Agriculture. (1976). U.S. Office of Education Bulletin No. 4. Washington, DC: United States Government Printing Office.

Rudolph, Jr., J. & Yoder, E. (1987). The effect of participation in secondary vocational agriculture on success in postsecondary education. Proceedings of the 14th Annual National Agricultural Education Research Meeting. Las Vegas, NV.

Shinn, G. & Buriak, P. (1988). The attributes and educational aspirations of the national FFA agricultural mechanics student contestants. Proceedings of the 37th Annual Southern Region Agricultural Education Research Conference. Orlando, FL.

Tyler, R. (1951). Basic principles of curriculum and instruction. Chicago: The University of Chicago Press.

Vaughn, P. (1977, Feb.). Integrating the FFA into the vocational agriculture curriculum. The Agricultural Education Magazine. pp. 183, 185.

Weber, D. (1991). Impact of Iowa FFA contests on participants' education and occupational aspirations. Master of Science thesis. Ames: Iowa State University.

PERCEIVED VALUE OF FFA CONTESTS AND AWARDS BY STUDENTS AND OTHER ADULT GROUPS

A Critique

David L. Doerfert ,Iowa State University -Discussant

The authors should be commended for their time and effort in studying factors relative to the perceived value of the FFA. Results of such study continue to facilitate efforts in addressing the charges forwarded five years ago by the Committee on Agricultural Education in Secondary Schools (Understanding Agriculture: New Directions for Education, 1988)

Several studies in recent years have sought to determine the factors that influence FFA involvement focused primarily on the factors within a given state (Connors, Moore, & Elliot, 1990; Luft & Giese, 1991; Hoover & Scanlon, 1991; Marshall, Herring, & Briers, 1992). The authors of this study should be commended for attempting a national study thus increasing the potential generalizability of the findings.

While the need for such study is warranted by the current activity within the profession, a careful review of the manuscript submitted raised several questions as to the methodology utilized and the recommendations forwarded.

- *The content and face validity of the research instrument were not reported thus raising questions regarding the validity of the findings.*
- *Seldom are the results of the school administrator group reported. Was there a problem with obtaining usable data from this group?*
- *Little is reported as to the characteristics of the respondents. Were these respondents from successful programs (top ten in contests, gold rated in awards, etc.); did respondents just participate when they thought they could win; or were the respondents simply regular FFA program participants? The paper stated that demographic differences were examined but neither the resulting data nor statistical analysis of this data were reported.*
- *Why were the researchers asking participating students about dropping out? Were these students identified as being "at-risk" of dropping out or was this the most accessible population to the researchers?*
- *What research results warrant the listing of the individual and group contest/ awards changes proposed in the Conclusions and Recommendations section? A review of the results reported did not provide support for these recommendations.*

While the need for such study is warranted by the current activity within the profession, increased attention must be given to research methodologies to enhance the generalizability of the findings.

Furthermore, if we as a profession desire to know the barriers to FFA involvement, we must strive to survey the audiences who are not currently involved with FFA programming.

DIFFERENCES IN ATTITUDES OF AGRICULTURAL EDUCATION AND OTHER VOCATIONAL EDUCATION COOPERATING TEACHERS REGARDING STUDENT TEACHING EXPECTATIONS

Jim Flowers, Associate Professor
Agricultural Education
North Carolina State University

Introduction

Many teacher educators consider the student teaching experience as one of the most critical elements in teacher education programs. Hauwiller, Abel, Ausel, and Sparapani (1988-89) refer to student teaching as the capstone of teacher training programs. The quality of the student teaching experience, because of its potential effect on preservice teachers, is a concern to the profession . Therefore, teacher educators have developed expectations for the student teaching experience that involve cooperating teachers, student teachers, and student teaching centers. However, even when expectations of a field-based teacher education program are outlined specifically, research has shown that the actual implementation of a program reflects a great deal of diversity (Goodman, 1983; Griffin, Barnes, Hughes, O'Neal, Edwards, & Defino, 1983; Zeichner & Liston, 1985).

University expectations for the student teaching experience are based on accepted educational theory and practice. Research conducted by Kirts and Claycomb (1981) found specific requirements for student teachers and student teaching programs vary widely a cross vocational teacher education institutions, but many common elements and policies remain. In order to communicate expectations to cooperating teachers, most universities with teacher education programs develop and distribute handbooks or manuals containing expectations to their cooperating teachers (Martin & Yoder, 1985). In most instances the cooperating teachers were selected for their professionalism and the quality of their local program. Yet, university supervisors often return from student teacher supervisor y visits with concerns regarding the supervision of student teachers (Martin & Yoder, 1985). Research conducted by Deeds, Flowers, and Arrington (1991) and Larke, Briers, and Norris (1991) concluded that teacher educators and cooperating teachers were in agreement regarding expectations of the student teaching experience. Why then, are there differences perceived between university expectations and cooperating teacher performance? These differences in expectations have led to calls for certification of cooperating teachers by some educators (Morris, Pannell, & Houston, 1984-85).

An explanation for these differences between expectation and performance may be the attitudes of the cooperating teachers to ward university expectations. Cohen (1964) defined attitudes as precursors of behavior and as such attitudes may influence the way in which cooperating teachers approach the student teaching experience. In addition, the attitudes of cooperating teachers may reflect their personal experiences and concerns related to the supervision of student teachers (Horst & Des Jarlais, 1984). According to Boiarsky (1985), attitudes and behaviors of teachers can be influenced by feedback and coaching from university teacher education faculty. Henson (1987) suggested that attitude change can be enhanced by involving those affected by the change, developing a sense of "ownership" in the change, and providing support for the change in attitude or behavior. Therefore, it appears that teacher educators can influence attitudes of cooperating teachers.

University-developed student teacher handbooks and student teaching manuals, no doubt, assist cooperating teachers in carrying out these general roles by providing more specific instructions and activities to be completed by student teachers. However, cooperating teachers may have had little input in the development of student teaching expectations, policies, and procedures. Hauwiller et. al (1988-89) suggested that little effort has been directed toward forging connections between teacher education programs at universities and public schools. In a national study of secondary agriculture teachers, Lelle and Kotrlik (1987) found that vocational agriculture teachers felt they had little opportunity for input in agricultural teacher education policies.

Purpose and Objectives

If attitudes are precursors of behavior and the attitudes of cooperating teachers influence student teachers, it is important to determine the attitudes of cooperating teachers toward student teaching. The first use of these data would be to identify the areas of conflict between teacher attitudes and university expectations. In addition, in order to provide information for agricultural teacher educators it is important to determine if agricultural education cooperating teachers have different attitudes toward student teaching expectations than other vocational education cooperating teachers. This knowledge would provide a basis for evaluating university expectations and/or providing inservice activities that would attempt to influence the attitudes of cooperating teachers.

As teacher education continues the current reorganization process, adjustments in student teaching programs may be mandated by accrediting agencies, and additional changes may be required. Input from the cooperating teachers could prove valuable in changing procedures and programs to meet new standards. The specific objectives of this study were:

1. To determine the attitudes of vocational education cooperating teachers in North Carolina regarding university expectations for cooperating teachers and the student teaching experience.

2. To determine if agricultural education cooperating teachers held different attitudes toward university expectations for the student teaching experience than cooperating teachers in other vocational education areas.

Procedures

The population of the study consisted of all vocational education teachers in North Carolina (N = 296) who had served as cooperating teachers for the universities in the University of North Carolina System within the previous five years and were still teaching. Teacher educators at each institution were contacted and asked to provide lists of cooperating teachers for their university. Two universities did not provide cooperating teacher lists and were not included in this study. Therefore, the accessible population involved eight of the ten universities in the University of North Carolina System with vocational teacher education programs (University of North Carolina, 1989). Proportional random sampling techniques were employed in order to assure that all vocational program areas were represented and to control for sampling error. To insure an adequate representation of agricultural education cooperating teachers (to meet objective 2), the 35 agricultural education cooperating teachers were treated as a separate population. Using sampling formulas suggested by Cochran (1977), 26 agricultural education cooperating teachers and 141 other vocational education cooperating teachers were selected to participate in the study. The sample was surveyed during the Spring Semester by the use of a mailed instrument. Non-respondents received a mailed reminder approximately two weeks following the established deadline for returning instruments. Usable responses were received from 120 cooperating teachers for a response rate of 71.8%. Nonresponse error was controlled by statistically comparing early respondents to late respondents, and no differences were found for any of the four subscales on the instrument. Therefore, the respondents were judged to be representative of the sample and the data were combined for an analysis.

The instrument used in this study was developed by Deeds, Flowers, and Arrington (1991) and was used in an earlier study involving agricultural education cooperating teachers. Only minor changes in the wording of the items to reflect vocational education terms were required. The original instrument was developed using student teaching expectations from selected vocational teacher education programs. Items included in student teaching handbooks, manuals, or printed policies were assumed by the researchers to represent university expectations for the student teaching experience. The instrument consisted of five demographic items and 31 items related to university expectations of the student teaching experience. A four-point Likert-type scale ranging from Strongly Agree to Strongly Disagree was used.

Content validity of the instrument was established by vocational education faculties at four universities with vocational teacher education programs. The 31 attitude items included four subscales (determined by factor analysis) with the following coefficients of internal consistency (Cronbach's Alpha): (a) role of the cooperating teacher=.63; (b) responsibilities of the student teacher=.68; (c) professionalism=.72; and (d) program components=.70.

Descriptive statistics, including frequencies of responses, percentages, and measures of central tendency and measures of variance were used to summarize the data. Differences between agricultural education cooperating teachers and other vocational education cooperating teachers were examined using t-tests. Multivariate analyses of variance (MANOVA) were used to control for experiment-wise error resulting from multiple t-tests and to account for intercorrelations among dependent variables.

Results

The agricultural education cooperating teachers in this study had been teaching an average of 20.5 years, compared to 17.5 years for other vocational education cooperating teachers. Masters degrees or above were held by 65% of the agricultural education cooperating teachers and 54% of the vocational education cooperating teachers. The agricultural education cooperating teachers had supervised an average of 2.45 student teachers during the past five years, while other vocational education cooperating teachers in this study had supervised an average of 2.20 student teachers over the same time period. The agricultural education cooperating teachers supervised an average of seven student teachers during their career, compared to five for the other vocational education teachers.

Responses to items on each of the four subscales were analyzed using multivariate analysis of variance. The overall analysis included the four subscales and found significant differences [Wilks' Lambda=0.766, F=8.77 (4, 115 df), $p < .001$] between responses of agriculture teachers and other vocational education cooperating teachers. Follow-up analyses indicated the differences were among three of the four subscales. Only for the subscale dealing with responsibilities of student teachers were there no significant differences between agricultural education cooperating teachers and other vocational education cooperating teachers [Wilks' Lambda=0.951, F=0.97 (6, 113 df), p=.45]. To determine the items that accounted for the differences between the groups, t-tests were used to analyze items within each of the remaining three subscales.

The data indicated that both groups of cooperating teachers tended to agree with most of the university expectations for student teaching. Twelve items in Part I of the instrument dealt with the role of the cooperating teacher. The cooperating teachers expressed lower levels of agreement in this area than for the other subscales. The highest rated item in this subscale was "Cooperating teachers should be on the school grounds when the student teacher is teaching" (see Table 1). Both groups of cooperating teachers also felt that they should maintain a teaching calendar to assist student teachers in planning. The areas in which some disagreement with university expectations was found were often items upon which agricultural education and the other vocational education cooperating teachers differed statistically. The agriculture teachers agreed (M=3.25), but other vocational teachers disagreed (M=2.61), that student teachers should be provided written evaluations weekly (t=3.27, p=.001). Another difference (t=3.90, $p < .001$) between the groups was found related to student teachers working independently as youth organization advisors, with agriculture teachers agreeing (M=3.26) and other vocational teachers disagreeing (M=2.61) with this expectation. Neither group of cooperating teachers felt student teachers should be observed each day they taught classes.

Table 1
Attitudes Toward the Role of the Cooperating Teacher in the Student Teaching Experience

	Ag Ed Teachers (n = 20)		Other Voc. Ed. Teachers (n = 100)		
Item	M	SD	M	SD	t
Cooperating teachers should be on the school grounds when the student teacher is teaching.	3.80	0.41	3.63	0.56	1.28
Cooperating teachers should make every effort to maintain their teaching calendar so student teachers can teach prepared plans.	3.45	0.51	3.45	0.50	0.01
Cooperating teachers should observe and evaluate student teachers along with the university supervisor during his/her visit.	3.15	0.88	3.18	0.81	0.16
Cooperating teachers should not be free to leave the school grounds when the student teacher is in charge.	2.95	0.83	3.18	0.77	1.20
Cooperating teachers should handle major discipline problems.	3.30	0.66	3.00	0.73	1.70
Cooperating teachers should review every teaching plan before the student teacher uses the plan.	2.75	0.72	3.04	0.78	1.54
Student teachers should be provided with instructional units to be taught the term or semester before student teaching.	3.15	0.67	2.95	0.79	1.06
Cooperating teachers should complete written evaluations of student teachers at least once per week.	3.25	0.72	2.61	0.82	3.27*
Cooperating teachers should give student teachers the opportunity to perform independently as youth organization advisors.	3.26	0.45	2.61	0.70	3.90*
Cooperating teachers should observe the student teachers' teaching performance each day.	2.60	0.88	2.71	0.98	0.45
Cooperating teachers should be responsible for providing university required experiences if not routinely available.	3.00	0.81	2.51	0.75	2.51
Cooperating teachers should be responsible for finding housing for student teachers, if necessary.	2.75	0.64	1.36	0.50	10.77*

Note. 4 = Strongly Agree; 3 = Agree; 2 = Disagree; 1 = Strongly Disagree.
* p < .01

The subscale involving the responsibilities of student teachers consisted of the six items shown on Table 2. The mean scores presented in Table 2 indicate that cooperating teachers tended to agree with university expectations involving student teacher responsibilities. The responses of agricultural education cooperating teachers did not differ statistically from the other vocational teachers on any of the items in this subscale. Both groups of teachers felt it was important for student teachers to dress professionally, to have written lesson plans for classroom and laboratory activities, and to participate in all of the activities conducted by the cooperating teachers. Less agreement among cooperating teachers was found for having written teaching plans completed at least one week in advance of teaching. In general, the cooperating teachers did not believe that student teachers should be required to live in the community in which they are student teaching.

Table 2
Cooperating Teacher Attitudes Toward Student Teacher Responsibilities

Item	Ag Ed Teachers (n = 20) M	SD	Other Voc. Ed. Teachers (n = 100) M	SD	t
Student teachers should be required to dress professionally while student teaching.	3.65	0.49	3.74	0.44	0.79
Student teachers should have written teaching plans for every classroom session they are responsible for teaching.	3.40	0.68	3.58	0.54	1.28
Student teachers should have written teaching plans for every laboratory session they are responsible for teaching.	3.35	0.67	3.52	0.60	1.11
Student teachers should be required to participate in all the activities participated in by the cooperating teacher.	3.30	0.80	3.31	0.68	0.02
Student teachers should have written teaching plans completed at least one week in advance of teaching.	2.70	0.66	3.10	0.79	2.13
Student teachers should be required to live in the community in which they are student teaching.	2.10	0.85	1.92	0.71	1.00

Note. 4 = Strongly Agree; 3 = Agree; 2 = Disagree; 1 = Strongly Disagree.

The eight items included in the "program components" subscale are shown on Table 3. The cooperating teachers reported agreement with university expectations for five of the eight items in this section. The highest level of agreement with university expectations in this area among the cooperating teachers was for "safe, adequate, and properly maintained laboratory facilities." Other items in this area with which cooperating teachers tended to agree were "having written policies for their vocational program," "assigning student teachers to programs that matched their area of specialization," and "having chartered youth organizations with written policies. It should be noted that the agricultural education cooperating teachers expressed significantly higher levels of agreement than the other vocational education cooperating teachers with the need to have a chartered youth organization. The agriculture teachers agreed with the need for functioning advisory committees (M=3.25), while the other vocational teachers did not feel advisory committees should be part of the criteria for selecting student teaching centers (M=2.78). Both groups felt adult education programs should not be required for student teaching centers.

Table 3
Cooperating Teacher Attitudes Toward Student Teaching Center Program Components

	Ag Ed Teachers (n = 20)		Other Voc. Ed. Teachers (n = 100)		
Item	M	SD	M	SD	t
Cooperating schools should have laboratory facilities that are safe, adequate, and properly maintained.	3.85	0.37	3.66	0.48	1.69
Cooperating teachers should have written policies and standards for their vocational programs.	3.55	0.51	3.39	0.57	1.17
Student teachers should be assigned to a site matched to their needs and areas of specialization.	3.20	0.62	3.43	0.56	1.65
Cooperating teachers should have written policies for vocational youth organizations.	3.50	0.51	3.29	0.63	1.39
Cooperating schools programs should have chartered youth organizations.	3.75	0.44	3.22	0.69	3.29*
Cooperating schools should have functioning advisory committees.	3.25	0.55	2.78	0.66	2.98*
Cooperating teachers should be on extended employment contracts.	2.30	1.03	2.03	0.83	1.27
Cooperating schools should be required to have adult education programs in place.	1.90	0.55	1.77	0.71	0.77

Note. 4 = Strongly Agree; 3 = Agree; 2 = Disagree; 1 = Strongly Disagree. * $p < .01$

Cooperating teachers expressed the highest levels of agreement for those items included on the "professionalism" subscale (see Table 4). Cooperating teachers tended to agree with four of the five items on this subscale. The strongest level of agreement was for "Cooperating teachers demonstrating an appropriate dress example." The agriculture cooperating teachers expressed significantly stronger agreement than their vocational counterparts that "Cooperating teachers should be members of professional organizations" ($t=4.54$, $p < .001$) and that they should be expected to "demonstrate professional growth by participating in programs outside of their district" ($t=4.05$, $p < .001$). The other vocational education cooperating teachers disagreed more strongly than agricultural education cooperating teachers that "cooperating teachers should hold the master's degree or above" ($t=3.36$, $p < .001$)

Conclusions and Recommendations

Both groups of cooperating teachers in North Carolina generally agreed with the expectations of the universities for the student teaching experience. The cooperating teachers were in strongest agreement with teacher educators on the items related to student teacher responsibilities and professionalism. Even though there was considerable agreement among cooperating teachers concerning university expectations, the fact that several of the cooperating teachers disagreed with some expectations was a concern and provided a basis for discussion. Teacher educators should do a better job of communicating expectations and the underlying rationale in workshops provided to the cooperating teachers and during student teaching visits.

Table 4
Attitudes Toward Characteristics of Professionalism Needed to Serve as Cooperating Teachers

	Ag Ed Teachers (n = 20)		Other Voc. Ed. Teachers (n = 100)		
Item	M	SD	M	SD	t
Cooperating teachers should demonstrate an appropriate dress example for the student teacher.	3.70	0.47	3.68	0.47	0.17
Cooperating teachers should be members of appropriate professional organizations.	3.80	0.41	3.04	0.72	4.54*
Cooperating teachers should have demonstrated professional growth through participation in other than district sponsored programs.	3.70	0.47	3.00	0.74	4.05*
Student teachers and cooperating teachers should both be present during discussions following observations by university supervisors.	2.95	0.76	3.05	0.84	0.50
Cooperating teachers should hold the masters degree or above.	2.75	0.91	2.08	0.79	3.36*

Note. 4 = Strongly Agree; 3 = Agree; 2 = Disagree; 1 = Strongly Disagree.
* $p < .01$

As might be expected, the items related to the expectations for cooperating teachers tended to receive lower levels of agreement among the cooperating teachers. Responses of the cooperating teachers indicated that they felt less supervision of student teachers was needed than did teacher educators. When almost 50% of the cooperating teachers disagreed that they should observe the student teacher every day, perhaps teacher educators should be concerned about the quantity and quality of supervision provided to student teachers. This is pointed out by a substantial percentage (25%) of cooperating teachers who did not feel it was important to re view lesson plans of student teachers prior to the lesson being taught.

The differences in attitudes between the agricultural education cooperating teachers and their vocational counterparts were most often found in the areas traditionally held as important to agricultural education -- working with youth organizations and advisory committees and participating in activities of professional organizations. Agricultural teacher educators should be encouraged that the cooperating teachers with whom they work placed a stronger emphasis on providing written feedback to the student teachers t hey supervise. Teacher educators in other vocational education program areas should continue to emphasize the importance of providing feedback, written and oral, to student teachers.

References

Boiarsky, C. (1985). Changing teachers' attitudes and behaviors through modeling and coaching. English Education, 17(1), 26-31.

Cochran, W. L. (1977). Sampling techniques. New York: John Wiley & Sons.

Cohen, A. R. (1964). Attitude change and social influence. New York: Basic Books, Inc.

Deeds, J. P., Flowers, J. L., & Arrington, L. R. (1991). Cooperating teacher attitudes and opinions regarding agricultural education student teaching expectations and policies. Journal of Agricultural Education, 32(2), 2-9.

Goodman, J. (1983). The seminar's role in the education of student teachers. Journal of Teacher Education, 34, 44-49.

Griffin, G., Barnes, S., Hughes, R., O'Neal, S., Edwards, S., & Defino, M. (1983). Clinical preservice teacher education: Final report of a descriptive study. Austin, TX: Research and Development Center for Teacher Education.

Hauwiller, J. G., Abel, F. J., Ausel, D., & Sparapani, E. F. (1988-89). Enhancing the effectiveness of cooperating teachers. Action in Teacher Education, 10(4), 42-46.

Henson, K. T. (1987). Strategies for overcoming barriers to educational change. NASSP Bulletin, 71(479), 125, 127.

Horst, L. & Des Jarlais, D. C. (1984). Naturally occurring attitude and behavior changes: Content and duration of the change process. Psychology: A Quarterly Journal of Human Behavior, 21(2), 36-42.

Kirts, C. & Claycomb, D. (1981). Student teaching management in agricultural education: A national study. Journal of the American Association of Teacher Educators in Agriculture, 22(1), 41-47, 64.

Larke, A., Briers, G., & Norris, R. (1991). A comparative assessment of teacher educator and supervising teacher perceptions concerning the selection of student teaching centers and supervising (cooperating) teachers in agriculture: A national study. Proceedings of the 40th Annual Southern Agricultural Education Research Conference, Lexington, KY.

Lelle, M. A. & Kotrlik, J. W. (1987). The opinions of vocational agriculture teachers toward state supervision and teacher education in agriculture. Journal of the American Association of Teacher Educators in Agriculture, 28(4), 21-25.

Martin, R. A. & Yoder, E. P. (1985). Clinical teaching analysis: A procedure for supervising teachers. Journal of the American Association of Teacher Educators in Agriculture, 26(4), 16-21, 33.

Morris, J. E., Pannell, S. K., & Houston, W. R. (1984-85). Certification of supervising teachers: A process for improving teacher effectiveness. Teacher Educator, 20(3), 7-15.

University of North Carolina. (1989). Educational opportunities. The University of North Carolina, 1989-90. Author.

Zeichner, K. & Liston, D. (1985). Varieties of discourse in supervisory conferences. Teaching and Teacher Education, 1, 155-174.

DIFFERENCES IN ATTITUDES OF AGRICULTURAL EDUCATION AND OTHER VOCATIONAL EDUCATION COOPERATING TEACHERS REGARDING STUDENT TEACHING EXPECTATIONS

A Critique

David L. Doerfert, Iowa State University--Discussant

The focus of this investigation was to determine the attitudes of vocational education cooperating teachers regarding university expectations during the student teaching experience. This study is important as earlier studies have supported the contention that the student teaching experience has a profound impact on the student teacher.

The well-constructed theoretical frame of the study "set the stage" for continued reading. Methodologically, the study was sound in most respects with acceptable procedures being followed. Good attention to detail is evident regarding concepts such as validity and reliability. An instrument developed in a study by other researchers was effectively utilized after minor modifications in wording.

The major finding of the study was that the cooperating teachers generally agreed with the expectations of the universities for the student teaching experience. This is not surprising as in practice decisions regarding the selection of student teaching sites will generally include the potential cooperating teacher's willingness to work cooperatively with the university staff. While there is typically some differences of opinion between and cooperating teacher and the university faculty as they relate to student teacher experiences and supervision, seldom is a site re-selected that completely disregarded the wishes of the university.

Where do we go from here? Perhaps we need to determine the effectiveness of our "training to be supervisors" model, or possibly, the lack thereof. What are the best practices of supervising a student teacher? Do university expectations for the student teaching experience truly reflect the competencies necessary by today's and future agriculture educators?

The research has explored an important area of concern. We as a profession must continue to assess the effectiveness of the student teaching experience as a means of applying the student's pedagogical knowledge base.

NAERM Fourth Session
1:30-3:00 p.m.
Concurrent Session L

Theme: The Effects of Hearing Protection Devices and Safety Practices in Agricultural Mechanics

Topic 1: Safety practices in agricultural science laboratories

Speaker: Michael Swan (North Dakota State University)

Topic 2: The effect of hearing protection devices under pink noise conditions on motor and cognitive performance

Speakers: Glen Miller, Steve Schimpp (University of Arizona)

Topic 3: Perceptions of farmers regarding indigenous knowledge systems

Speakers: B. Rajasekaran, Robert Martin (Iowa State University)

Topic 4: Readership survey of the FFA New Horizons magazine

Speakers: James Connors, Jack Elliot (The University of Arizona)
Dave Krueger (Michigan State University)

Discussant: Leon Schumacher (University of Missouri)

Chairperson: David Hall (The Pennsylvania State University)

Facilitator: William Annis (University of New Hampshire)

SAFETY PRACTICES IN AGRICULTURAL SCIENCE MECHANICS LABORATORIES

Michael K. Swan
Assistant Professor
Agricultural & Extension Education
North Dakota State University

Introduction

Agricultural mechanics students are exposed to equipment, materials, and supplies that are potentially hazardous to their health and that could cause injury or death (Johnson & Fletcher, 1990). Instructional safety programs are a must and therefore should be of high priority to the instructor. The most important responsibility of the instructor is to ensure the safety of the students (Daniels, 1980). It is essential that instructors provide a safe and healthy learning environment for students enrolled in these courses (Padham, 1990). Students in agricultural mechanics learn and pattern future work habits around conditions learned while enrolled in agricultural mechanics courses.

Studies have shown that students must develop more than acquired knowledge and skills in machine operation. Students must develop safe attitudes towards the work environment. Students should be taught that accidents happen and that accident causes can be pre-identified (Reynolds, 1980). Burke (1989) studied accident frequency and found that five student accidents per year per teacher was excessive. Burke concluded that safety instruction should be enhanced and that further studies be conducted. A 1990 study reported that accidents were happening at the rate of more than eight per year per instructor (Hoerner & Bekkum, 1990).

There is evidence that unsafe conditions are found in many agricultural mechanics laboratories. Studies have found that many instructors are not using recommended safety practices or providing safe learning environments (Johnson & Fletcher, 1990). It was noted that these instructors indicated that their preparation in safety practices was deficient in many areas. No current literature was found concerning the state of safety practices in agricultural mechanics laboratories located in North Dakota.

According to Jacobs and Turner (1981) and Storm (1979), 95% of all work-related accidents could be avoided if proper safety precautions were employed. Since agricultural mechanics laboratory safety is such an important priority for instructional programs, it was apparent that laboratory safety practices used by instructors needed to be examined.

Purpose and Objectives

The purpose of this study was to ascertain the safety practices currently being used in agricultural mechanics laboratories. A secondary purpose was to provide baseline data from which recommendations for safety program improvements and inservice training could be offered. Specific objectives were as follows:

1. To determine the instructional techniques employed by agricultural mechanics instructors in the agricultural mechanics safety program.

2. To determine instructional materials currently being used by agricultural mechanics instructors to teach laboratory safety.

3. To determine the safety and emergency equipment available in the agricultural mechanics laboratories.

Procedures

The population for this study was composed of all North Dakota secondary agricultural mechanics instructors employed in the 1991-92 academic year. The state supervisor of agricultural education and teacher educator in agricultural education developed a list of all instructors. The entire population ($N=89$) was surveyed. The data were collected via self-administered mailed questionnaires. The instrument developed by Hoerner & Kesler (1989) was modified to fit specific conditions of the population.

The revised instrument was examined by experts in agricultural engineering and agricultural mechanization and judged to be valid. To further ensure the validity of the instrument, it was pilot tested with students enrolled in an agricultural teaching methods course the spring of 1991. An analysis of the reliability of the instrument was determined to be $r=.84$ using Cronbach's alpha reliability coefficient at the .05 alpha level. The statistical computer program Statgraphics was used for data analysis. Descriptive statistics (means, standard deviations, and percentages) were used to describe the population of this study.

Findings/Results

Usable responses were received from 69 of 89 agricultural mechanics instructors for a 77.5% response rate. Comparison of early and late respondents on identified demographic variables, safety practices used, and safety and emergency equipment available revealed no significant difference ($p<.05$) existed. Therefore, the results were generalized to the population (Miller & Smith, 1983).

The composite instructor respondent had 10.5 years of teaching experience, had completed 8 quarter hours of college-level agricultural mechanics course work as an undergraduate, had liability insurance coverage in excess of $150,000 (79.6%), and had 13.1 students in his agricultural mechanics courses. The typical agricultural mechanics laboratory was 2000 square feet or more in size (60.1%) and over 15 years old (75.5%). The typical agricultural mechanics instructor devoted 58.3% of his instructional time to teaching agricultural mechanics, felt somewhat prepared to very well prepared to provide safety instruction in agricultural mechanics (63.2%), and devoted 15.1% of his agricultural mechanics instructional time to safety related instruction.

When asked to record the number of major accidents (requiring medical attention) that occurred in the agricultural mechanics laboratory during the past five years, the mean response was 1.3 accidents per year. Instructors' reported the occurrence of minor accidents (requiring bandage but not doctor or nurse attention). During the same five year period, the mean number of accidents was 13.3 accidents per year. Four instructors reported 40 or more minor accidents, while 45 (65.2%) of the instructors indicated they did not maintain written accident report files.

Instructors were asked to identify instructional techniques used in their safety instructional program in agricultural mechanics. Table 1 lists the number and percentage of respondents who reported using each of the instructional techniques in their agricultural mechanics safety programs. The instructional techniques used most often were students demonstrating safe use of power tools and teachers conducting safety demonstrations on power tools (97.1%). The least used instructional technique was providing each student with a copy of appropriate safety laws (18.8%).

Table 1
Instructional Techniques Used by Agricultural Mechanics Instructors in the Agricultural Mechanics Safety Program (N=69)

	Use Technique		Do Not Use	
Instructional Technique	n	%	n	%
Students demonstrate safe use of power tools	67	97.1	2	2.9
Teacher conducts safety demonstrations - power tools	67	97.1	2	2.9
Students study safety subject matter	65	94.2	4	5.8
Student pass safety examinations	65	94.2	4	5.8
Teacher conducts safety demonstrations - hand tools	65	94.2	4	5.8
Students demonstrate safe use of hand tools	61	88.4	8	11.6
Students' safety examinations are filed	55	79.7	14	20.3
Clean up schedules are used by students	45	65.2	24	34.8
Unscheduled safety inspections are conducted	36	52.2	33	47.8
Scheduled safety inspections are conducted	25	36.2	44	63.8
Students each have a copy of appropriate safety laws	13	18.8	56	81.2

Agricultural mechanics instructors were asked to identify the instructional materials used in the safety instruction. Table 2 identifies manuals and booklets as the most commonly used instruction material (94.2%). The use of microcomputer programs was identified as the least used by respondents (24.6%).

Table 2
Instructional Materials used by Agricultural Mechanics Instructors in their Instructional Safety Programs (N=69)

	Use Technique		Do Not Use	
Instructional Technique	n	%	n	%
Manuals and booklets	65	94.2	4	5.8
Worksheets	59	85.5	10	14.5
Videotapes	53	76.8	16	23.2
Transparencies	49	71.0	20	29.0
Slides and filmstrips	42	60.9	27	39.1
16 mm films	24	34.8	45	65.2
Microcomputer programs	17	24.6	52	75.4

The safety equipment or materials which are available for student use in agricultural mechanics laboratories are listed in Table 3. The most commonly provided items of safety equipment are industrial quality eye protection and welding gloves (97.1%). The safety equipment or material provided least was steel toes shoes/boots (2.9%).

Table 3
Safety Equipment or Materials That Are Used or Available for Students in the Agricultural Mechanics Laboratory (N=69)

Safety Equipment/Materials	Available n	Available %	Not Available n	Not Available %
Industrial quality eye protection	67	97.1	2	2.9
Welding gloves	67	97.1	2	2.9
Shop coats or coveralls	59	85.5	10	14.5
Welding aprons or jackets	42	60.9	27	39.1
Dust masks	31	44.9	38	55.1
Hard hats	21	30.4	48	69.6
Hearing protection - ear plugs	14	20.3	55	79.7
Hearing protection - ear muffs	10	14.5	59	85.5
Respirators	10	14.5	59	85.5
Bump/Skull caps	4	5.8	65	94.2
Steel-toed shoes/boots	2	2.9	67	97.1

Table 4 identifies the safety practices, equipment or materials found agricultural mechanics laboratories. The most common practice, equipment or material found were welding booths with screens/curtains and welding exhaust systems (97.1%). It should be noted that 4 respondents did not have fire extinguishers available and 8 respondents did not have fire alarms located in their laboratories. Panic buttons (14.5%) were the least frequently reported safety item reported. Less then half of the safety or emergency items identified in Table 4 were available in more than 70.0% of the respondents' agricultural mechanics laboratories.

Table 4
Safety Practices, Equipment or Materials Used in the Agricultural Mechanics Laboratory (N=69)

Safety Practices, Equipment, Materials	Used n	Used %	Not Used n	Not Used %
Welding booths with screens/curtains	67	97.1	2	2.9
Welding exhaust system	67	97.1	2	2.9
Safety guards on all equipment	66	95.6	3	4.4
First aids kit/boxes	65	94.2	4	5.8
Fire extinguishers available	65	94.2	4	5.8
Fire alarm	61	88.4	8	11.6
Exits marked	59	85.5	10	14.5
Safety cans for flammable liquids	48	69.6	21	30.4
Safety rules posted near power tools	41	57.4	28	40.6
Safety poster posted near power tools	39	56.5	30	43.5
Safety cabinet for flammable /explosive materials	39	56.5	30	43.5
Vehicle safety stands available	39	56.5	30	43.5
Fire blanket	37	53.6	32	46.4
Safety zones around tools	27	39.1	42	60.9
Fume exhaust system	25	36.2	44	63.8
Eye safety laws/rules posted	24	34.8	45	65.2
Color-coded power tools	13	18.8	56	81.2
Non-skid areas around power tools	13	18.8	56	81.2
Eye wash	13	18.8	56	81.2
Panic button	10	14.5	59	85.5

Conclusions and Recommendations

The findings of this study are consistent with the results of similar studies in Missouri (Lamb, 1984), Nebraska (Rudolph & Dillon, 1984), Ohio (Gliem & Hard, 1988), Iowa (Hoerner & Bekkum, 1989), and Mississippi (Johnson & Fletcher, 1990). It is apparent that North Dakota secondary agricultural mechanics instructors are not using recommended safety practices or providing student safety and emergency equipment to the extent warranted by the hazards present in the agricultural mechanics laboratory.

The instructional techniques most commonly used in safety instruction were demonstrations conducted by students and instructors in the use of power tools. Passing of safety examinations was required by most instructors (94.2%).

Safety manuals and booklets and worksheets were the instructional materials most often used by agricultural mechanics instructors. Microcomputer programs related to safety were the least frequently used instructional material.

Industrial-quality eye protection and welding gloves were the most frequently available safety equipment for use by students. The most frequently available safety practices, equipment, or materials were welding booths with screens/curtains, welding exhaust system, safety guards on all equipment, first aid kits/boxes, fire extinguishers, fire alarms, and marked exits. These findings are consistent with the findings of similar studies (Hoerner & Bekkum, 1990; Johnson & Fletcher, 1990).

Based upon the results of this study, it is evident that unsafe conditions exist in many secondary agricultural mechanics programs in North Dakota. Safety program improvements must become an important priority for agricultural mechanics instructors and their administrators.

The following recommendations are based on the results of this study:

1. Inservice programs on agricultural mechanics safety should be conducted for agricultural mechanics instructors and should include local program administrators.

2. Instructor preparation programs should be examined to determine if additional emphasis should be placed on safety instruction in laboratories.

3. Safety topics should be identified and taught during both preservice and inservice educational programs.

4. Local and federal funds should be earmarked for use in improving the safety and emergency equipment available to instructors and students.

References

Burke, S. R. (1989). Accidents in Virginia secondary agriculture programs. Proceedings of the 38th Southern Agricultural Education Conference. Jackson, MS.

Daniels, J. H. (1980). Safety: A reverent responsibility. The Agricultural Education Magazine, 53(3), 4.

Gliem, J. A. & Hard, D. L. (1988). Safety in vocational agriculture programs. Paper presented at the winter meeting of the American Society of Agricultural Engineers. Chicago, IL.

Hoerner, T. A. & Kesler, K. (1989). Factors related to safety instruction in Iowa secondary agricultural mechanics programs. Paper presented at the 43rd Annual Central States Seminar in Agricultural-Agribusiness Education. Chicago, IL.

Hoerner, T. A. & Bekkum, V. A. (1990). Factors related to safety instruction in secondary agricultural mechanics programs in seven selected states. Paper presented at the 36th Annual NACTA Conference. Morrisville, NY.

Jacobs, C. O. & Turner, J. H. (1981). Developing shop safety skills. American Association for Vocational Instructional Materials. Athens, GA.

Johnson, D. M. & Fletcher, W. E. (1990). An analysis of the agricultural mechanics safety practices in Mississippi secondary agriculture teachers. Proceedings of the 39th Southern Agricultural Education Research Conference. San Antonio, TX.

Lamb, W. (1984). Variables affecting laboratory planning and operation. Unpublished doctoral dissertation, University of Missouri-Columbia.

Miller, L. E. & Smith, K. L. (1983). Handling nonresponse issues. Journal of Extension, 21(5), 45-50.

Pedham, E. A. (1990). Safety: Your first responsibility. Vocational Education Journal, 65(2), 16-17.

Reynolds, C. L. (1980). Safety instruction: Is it enough? Agricultural Education Magazine, 53(3), 7-8.

Rudolph, J. L. & Dillon, R. D. (1984). A comparison of existing standards found in Nebraska vocational agricultural mechanics laboratories with standards developed on a regional and national level. Proceedings of the 11th Annual National Agricultural Education Research Meeting. New Orleans, LA.

Storm, G. (1979). Managing the occupational education laboratory. Ann Arbor, MI: Prakken Publications.

SAFETY PRACTICES IN AGRICULTURAL SCIENCE MECHANICS LABORATORIES

A Critique

L. G. Schumacher, University of Missouri--Discussant

The researcher has chosen an important issue to investigate. The safe use of the agricultural mechanics laboratory has been closely scrutinized by other researchers both past and present. Society is particularly willing to bring lawsuits forward in an attempt to secure a financial settlement.

The objectives were clear- to access what instructional techniques, instructional materials, and safety and emergency equipment are available and used in the agricultural mechanics laboratory. It was reasoned that instructional improvements and inservice training recommendations would be made as a result of this research.

The procedures, results and findings were presented concisely and could easily be replicated by other researchers.

An issue that should be addressed is the collection of data. Miller and Smith (1983) were cited as a rationale for not conducting a survey of nonrespondents. Although this procedure is often used, I question the use of a demographic variable when comparing early and late respondents.

The use of "appropriate clothing" is an issue that should be considered should another researcher replicate this investigation. Welding aprons and jackets are not appropriate for use in a horticultural science laboratory.

I agree that local program administrators should be a part of an inservice effort. However, the findings of this investigation do not suggest that their knowledge about safety instruction is lacking. Although a lack of adequate funding could be central to the issue, the findings of this investigation do not suggest that additional funding is needed to reduce safety hazards in the agricultural mechanics laboratory.

My compliments to the researcher on a good study.

THE EFFECT OF HEARING PROTECTION DEVICES UNDER PINK NOISE CONDITIONS ON MOTOR AND COGNITIVE PERFORMANCE

Dr. Glen M. Miller
Associate Professor
Agricultural Education
The University of Arizona

Mr. Steve Schimpp
Research Associate
Agricultural Education
The University of Arizona

Introduction

The effect of noise on human performance has long been a topic that brings a strong emotional response. Much is at stake in industrial climates because of the potential cost involved in reducing noise. Some researchers assume that noise impairs human function while others believe that it does nothing but make hearing more difficult. According to Harris (1979),

> The first group sees any statement that a given function is as efficient in noise as in quiet as an argument for keeping noise levels high and therefore as objectionable; the second group tends to support that it is a waste of time to examine the accidents or errors of workers in a factory where there are no complaints. Both these extreme views are false. The effects of noise on performance are definite, but depend very much upon the task which is being performed.

To place the term "task" into educational terms, we may categorize tasks into cognitive and psychomotor activities.

According to Suter (1992), "Noise can cause adverse effects on task performance and behavior at work, and in non-occupational and social settings. These effects are the subject of some controversy; however, since they do not always occur as predicted."

Effects of noise can be expected because noise increases the general state of arousal of the nervous system. This arousal may be positive in increasing efficiency or it may annoy and detract from performance. Loeb (1986) stated "There appear to be real effects and aftereffects of noise on performance, though these are not as profound or as ubiquitous as the public believes, and in some cases the effects are facilitative rather than detrimental."

Individual differences must be considered in the design of investigations into human performance under noisy conditions. Harris (1979) noted, "There is wide variation in the threshold of annoyance for different individuals. This wide range is, to some extent, a result of differences in the personality traits of various individual listeners. In general, extroverts have a higher annoyance tolerance for noise than introverts."

Certain generalizations are true regarding the ways various types of noise affect human performance. It appears that noise with little variation will not affect performance to any great degree at low decibel levels. Unpredictable, intermittent sounds may reduce performance. Performance variations are more likely to be measurable above sound pressure levels of 95 Db, and there is indication that high frequencies affect performance more seriously than low frequencies. The use of hearing protection devices helps to reduce adverse effect of noise on performance.

Investigations of the effect of noise on performance have been done widely in industry and some research has been conducted in agricultural education. Broste et al. (1989) found a significant exposure to noise and a prevalence of hearing loss among 872 vocational agriculture students actively involved in farm work. An early study in agricultural education was Miller's

1986 study, "Effects of Hearing Protection Device on Cognitive and Motor Performance of Students in Noisy Environments." This study was designed as a randomized, post-test only, control group experimental design. A sample of 60 subjects plus 22 replacements was identified from 162 subjects enrolled in vocational agriculture in 13 Mississippi public secondary schools. Each student completed recognized and standardized fine motor skill and cognitive tests while a recorded and equalized chain saw noise amplified to 100 Db(A) was played in the background. The experimental group used a foam type hearing protection device (HPD) with an attenuation of 31 Db(A). The control group used a placebo device. Statistically significant differences were found in both the motor and cognitive tests for the experimental group. A 13% higher performance score was detected on cognitive activities and a 4% higher performance on motor activities was detected for the group wearing the hearing protection device. The chain saw noise used in the Miller study (1986) had variable sound pressure levels within frequencies and high levels in high frequencies.

In 1976 Cohen reported data on accident rates for four hundred workers in high noise jobs. His study was conducted over a two year period and measured accident rates before and after the introduction of hearing protection devices. He found a significant reduction in accidents after the intervention compared to no change in the injury rate of workers in low noise areas.

Would improvements in performance as a result of wearing hearing protection devices be detected under conditions similar to the Miller (1986) study if the type of noise generated had a continuous frequency spectrum and a constant power within bandwidth?

Purpose and Objective

The purpose of this study was to examine the effects of hearing protection devices on student performance of cognitive and motor skills under conditions of intense noise of equal power in all frequencies. The objective of the study was to determine the effect of hearing protection devices on cognitive and psychomotor performance of students enrolled in agricultural mechanics programs at the secondary school level when subjected to noise of equal power in all frequencies.

Methods

This study included students enrolled in agricultural education programs offering agricultural mechanics activities within a 90 mile radius of the university. Approximately 1,035 students were enrolled in 15 agricultural education programs within this radius and approximately 260 of those students were juniors or seniors enrolled in agricultural mechanics coursework.

The study was conducted as a randomized, post-test only, control group experimental design (Campbell & Stanley, 1963).

The selected noise was a pink noise generated by a Cetec Ivie IE 20B pink and white noise generator, amplified by a 100 amp amplifier and broadcast through four speaker columns. Pink noise was selected because it is noise with equal energy per octave bandwidth, a very "flat" noise unlike the chain saw noise used in the Miller (1987) study.

The population frame consisted of approximately 260 advanced agricultural education students (11th and 12th grade) who attended one of 15 public schools offering agricultural education within a 90 mile radius of the university. Students with observable hearing losses as identified by their agricultural education teacher were removed from the population before the random sample was drawn. The random sample consisted of 132 students plus replacements at each site to allow for absences on the day of testing. Students were randomly assigned to treatment and control groups. All testing was done in the agricultural mechanics laboratory at each of the 15 schools with equipment, student seating, and instructions replicated.

Standardized tests of psychomotor and cognitive performance were used. The Talent Assessment Program (TAP) Test 7, Finger Dexterity with Small Tools, was used to measure motor performance. The test has a coefficient of stability of .86. It has been in service for 15 years and has been adopted by the state of Iowa. Content validity was established based upon the fact that the test uses tools and materials common to the agricultural industry. The cognitive test consisted of multiple pages of single digit addition and subtraction problems (Judge, 1978). These simple addition problems were provided in large numbers to prevent students from completing the problems before the 10 minute testing time period ended. Pilot evaluations were conducted on the equipment, the tests, and administration procedures.

At each test site, students were given practice time with the motor test and then provided hearing protection devices and instructed on the proper way of inserting the devices in the ear. The treatment group received a hearing protection device capable of reducing noise by 35 Db while the control group received a placebo device carefully packaged to resemble a HPD complete with instruction for insertion. The device consisted of 1/4 of a cotton ball capable of less than 5 dB of noise reduction. Both groups performed the tests concurrently. The sound system was activated and a 100 dB level adjusted by monitoring the sound level at the student seating location. On the psychomotor test, each student's score was the number of minutes required to complete the assembly of the motor test as measured by a digital clock calibrated in minutes and tenths of minutes. For the cognitive test, each student's score was the number of problems completed correctly during a timed 10 minute test period.

Findings

At total of 132 students provided usable data summarized in the findings. The test scores were subjected to a one way analysis of variance. The ANOVA for the motor test revealed no significant differences between the treatment and control groups using the pre-selected level of p =.05. Table 1 presents the ANOVA results.

Table 1
ANOVA of Treatment by Control for Motor Scores

Source of Variation	DF	SS	MS	F	P
Factor	1	2.51	2.51	0.79	0.376
Error	130	413.85	3.18		
Total	131	416.36			

Table 2 reveals that the mean for the motor control group was 9.545 minutes while the treatment group was 9.821 minutes. This slightly slower motor performance for the treatment group was not expected and was the opposite of the results found in Miller (1987).

The ANOVA for the cognitive test revealed no significant differences between the treatment and control group using the pre-selected level of p =.05. Table 3 presents the ANOVA results.

Table 2
Descriptive Statistics of Motor Scores for Control and Treatment Groups

Group	N	Mean	Median	TR Mean	SD	SE Mean	Minimum	Maximum	Q1	Q3
Treat	66	9.821	9.950	9.780	1.620	0.199	6.800	13.700	8.800	10.9
Control	66	9.545	9.600	9.427	1.934	0.238	6.400	17.000	8.075	10.6

Table 3
ANOVA of Treatment by Control for Cognitive Scores

Source of Variation	DF	SS	MS	F	P
Factor	1	14997	14997	1.77	0.186
Error	130	101432	8473		
Total	131	1116429			

In the case of the cognitive measure, the mean for the control group was higher (325.1 problems correct in 10 minutes) than the mean for the treatment group (303.82 problems correct in 10 minutes). There was a wide range between the minimum and maximum scores for both groups. Descriptive statistics for the cognitive measure are presented in Table 4.

Table 4
Descriptive Statistics of Cognitive Scores for Control and Treatment Groups

Group	N	Mean	Median	TR Mean	SD	SE Mean	Minimum	Maximum	Q1	Q3
Treat	66	303.82	298.50	303.10	79.86	9.83	127.00	501.00	249.00	364.00
Control	66	325.10	309.50	322.27	102.80	12.70	122.00	606.00	253.00	391.20

The slightly higher number of correct problems on the part of the control group was not expected. In Miller's 1986 study, using chain saw noise, the treatment group performed 14% better then the control group on the cognitive activity.

Conclusions

Under the conditions of this experiment, no statistically significant differences were measured in student performance on cognitive or motor performance under the condition of 100 decibels of pink noise. It may be concluded that the intensity of noise is not the primary factor in reduction in performance, but there is an interaction from the nature of the noise. In the Miller (1986) study, relatively high frequency noises produced by a chain saw were linked with statistically significant and practically significant differences in student performance. With a broad and equally balanced pink noise, these differences were not seen and, in fact, some performance enhancement may have occurred.

Recommendations .

The researcher would recommend that for purposes of improving student performance in noisy environments, the nature of the noise must be identified. Protection against noise below the levels of hearing damage may not be necessary if the noise is in lower frequencies. Higher frequency noise may indeed interfere with student performance. Efforts need to be made to map the frequency generation of noise sources in agricultural mechanics laboratories. It is possible that the artificial generation of noise in all frequencies or within the frequencies which are missing in a noisy agricultural mechanics laboratory may be effective in canceling the detrimental effects of high frequency noise on student performance. It remains to be seen if a noise canceling approach would be safe, economical, and an effective approach in improving student performance under noisy conditions. It would also be of interest to determine if performance enhancement can be achieved with broad band background noise as opposed to a quiet environment.

References

Broste, S. K., Hansen, D. A., Strand, R. L., & Steuland, D. T. (1989). Hearing loss among high school farm students. American Journal of Public Health, 79(5), 619-622

Cohen, A. (1976) in Smith, A. P., & Jones D. M.(1992). Handbook of human performance, Volume 1, the physical environment. New York: Academic Press, Harcourt Brace Jovanovich.

Campbell, D. T. & Stanley, J. C. (1963). Experimental and quasi-experimental designs for research. Chicago: Rand McNalley & Company.

Harris, C. M. (Editor). (1979). Handbook of noise control. New York: McGraw-Hill Book Company.

Leob, M. (1986). Noise and human efficiency. New York: John Wiley & Sons.

Miller, G. M. (1987). Effects of hearing protection device on performance of students in noisy environments. The Journal of the American Association of Teachers Educators in Agriculture, 28(3).

Suter, A. H. (1992). Noise sources and effects--a new look. Sound and Vibration, the Noise and Vibration Control Magazine, 26(1), 18-42.

THE EFFECT OF HEARING PROTECTION DEVICES UNDER PINK NOISE CONDITIONS ON MOTOR AND COGNITIVE PERFORMANCE

A Critique

L. G. Schumacher, University of Missouri--Discussant

The researchers have chosen an important issue to investigate. The amount of noise generated in the agricultural mechanics laboratory often reaches levels can lead to permanent hearing damage. The individual who is often impacted the most by hearing loss is the instructor.

The objectives were clear--what effect would the use of a hearing protection device have on student motor and cognitive performance. Earlier work conducted by Broste et. al (1989) suggested that students who were subjected to noise amplified to 100 Db(A) had diminished motor and cognitive capabilities as well as students who were not subjected to high noise levels.

The study was well done. It could be replicated and one could expect to secure similar results after each replication.

Issues that were not clear in the paper included whether the placebo hearing protection device that was used was constructed or purchased by the researchers. If it was constructed, how was the level of protection for each device measured?

It is not clear which empirical hearing test was used to determine which students had previous hearing losses. What hearing loss evidence did the high school teacher have which justified excluding them from the investigation?

Were equal amounts of practice time given to each student prior to taking the motor test or were students allowed to start whenever they felt comfortable? Were differences in IQ considered when analyzing their cognitive performance? Were the student's preferred learning styles documented and compared prior to taking the exam?

I extend my compliments to the researchers for conducting a timely and sound piece of research.

PERCEPTIONS OF FARMERS REGARDING INDIGENOUS KNOWLEDGE SYSTEMS

B. Rajasekaran
Information Scientist
Consortium for International Earth Science
Information Network (CIESIN)
Saginaw, Michigan

Robert A. Martin
Professor
Agricultural Education & Studies
Iowa State University

Introduction

Technological efforts to increase food production through modern technologies have rarely considered indigenous knowledge systems around which resource-poor farmers normally operate (Warren, 1991a, 1991b). The agricultural research-extension system in India in the past has overlooked indigenous agricultural knowledge (Rajasekaran, 1993). Moreover, attitudes generated by the top-down transfer of technology (TOT) paradigm have precluded researchers and extensionists from learning indigenous knowledge systems (Rajasekaran & Martin, 1990).

Agricultural research for the most part has been highly reductionist, parochial, and discipline-oriented (Richards, 1986). Normal science generates packages, whereas resource-poor families engage in farming as a continuous performance (Chambers & Ghildyal, 1985). Research station technologies have focused primarily on attaining high yields of target crops. The introduction of high energy technologies through the application of chemical fertilizers, agrochemicals, machinery, and modern methods of irrigation in developing countries was a departure from traditional agriculture and has led in many cases to pollution and land degradation (Ezaza, 1989).

Agricultural extension professionals usually are not aware of local classification systems of farmers regarding soils, crops, livestock, and other natural resources. A case study conducted by the International Crops Research Institute for Semi-Arid Tropics (ICRISAT) in Shirapur, a South Indian village, showed that the indigenous soil categories of farmers were more accurate than the formal system in stratifying the soils into groups for analysis and provided improved bases for indexing variations in land quality (Dvorak, 1988). Because soil analysts in soil testing laboratories (STLs) are not familiar with the indigenous classification system, their fertilizer recommendations may not fit in with the local soil categories.

A case study conducted by Rajasekaran indicates that the indigenous classification of rice varieties in Chengalpattu District, Tamil Nadu State, is based on criteria such as water source, cropping season, crop duration, and grain quality (Rajasekaran & Warren, 1993). The village extension workers disseminate information on the seed varieties recommended by the researchers to the farmers. These extension decisions are reflected in the types of seeds made available through the seed multiplication units. Although several varieties suitable to semi-arid zones of Tamil Nadu are adapted to severe drought conditions, most of the varieties being encouraged through the agricultural extension system are suitable only in resource-rich environments such as those with an assured supply of irrigation. The indigenous, locally adapted varieties of rice are no longer as easily available (Rajasekaran, Warren & Babu, 1991).

During the process of technology dissemination, feedback information from farmers after the introduction of technologies is rarely recorded. Development of technologies in research stations has become a continuous process without looking at what is happening in the field. In summary, farmers' needs, priorities and innovations are not considered while developing and disseminating technologies from the research-extension pipeline. Certain potential limitations in indigenous knowledge systems have strengthened the attitudes of outsiders that indigenous knowledge systems are 'primitive,' 'unproductive' and 'irrelevant': (1) indigenous knowledge systems are oral in nature; (2) indigenous knowledge systems are not documented; (3) each individual possesses only a part of the community's indigenous knowledge system; (4) indigenous knowledge systems may be implicit within local people's practices, actions, and reactions, rather than a conscious resource; and (5) finally, farmers' rarely recall information on quantitative data pertaining to their indigenous knowledge systems (Reijntjes et al., 1992).

In addition, lack of relevance to small farm conditions was found to be one of several constraints in the research station technologies. Kerr and Sanghi (1992) provided a specific example from Andhra Pradesh, India, to support the above statement. The conventional graded bunding system is not an appropriate soil and moisture conservation technology under small-scale dryland farming conditions due to the following reasons:

1. Continuous bunds leave corners in some fields thus creating the risk of losing the piece of land to the neighboring farmer;

2. Contour farming causes inconvenience in field operations (particularly where multi-row implements are used) and reduces the efficiency of operations (where the *desi* plough is used) due to repeated cultivation in the same direction;

3. Systems based on a central water course provide benefit to some farmers at the cost of others with regard to disposal of excess runoff; and

4. The overall system emphasizes only long-term gains, hence creating an impression that short-term gains are not possible through such measures (Kerr & Sanghi, 1992, p.2).

Keeping these theoretical foundations in perspective, a research study was conducted to identify the perceptions of farmers regarding indigenous knowledge systems and draw implications to agricultural and extension education.

Purpose and Objectives

The purpose of the study was to identify the perceptions of farmers regarding indigenous knowledge systems. The specific objectives of the study were:

1. To determine the extent to which farmers agreed with selected indigenous decision-making systems;

2. To determine the extent to which selected indigenous technical practices are being used by farmers;

3. To determine the influence of selected indigenous technical practices on productivity;

4. To determine the influence of selected indigenous technical practices on sustainability;

Procedures

This research study was conducted using a variety of farmer participatory rural appraisal methods (Rajasekaran, 1993). Though these approaches are time-consuming, they are highly valid and reliable for elucidating and identifying the perceptions of indigenous knowledge systems of farmers. Participatory rural appraisal methods such as transecting, participant observations, and unstructured interactions, followed by instrumentation were used to collect data for this study. A list of 106 statements on indigenous decision-making systems, indigenous knowledge, and indigenous technical practices (ITPs), was compiled based on the qualitative information collected from the transecting and participant observation stages. These ITPs were divided into the ten sub-sections based on the crops and characteristics of the practices involved.

The survey instrument utilized a Likert-type scale with points ranging from 1 to 5 as the method for obtaining the data. The scale was used to collect information regarding perceptions of farmers in the following areas: (a) extent to which factors influencing indigenous decision-making systems are agreeable to farmers; (b) extent to which indigenous knowledge is believed to be true by farmers; and (c) extent to which indigenous technical practices are currently utilized by farmers. The study was regional in scope. The study was conducted in the Union Territory of Pondicherry, India. The target population for the study was 15,753 farm households of the Union Territory of Pondicherry. A cluster sampling procedure was adopted in order to select the sample. The principle of cluster sampling procedure was highlighted by Hinkle, Wiersma, and Jurs (1989, p.167): "Cluster sampling involves the selection of clusters rather than individual population members. When a cluster is selected for the sample, all members of that cluster are involved in the sample. Three villages---Sivaranthakam, Kizhur, and Pillayarkuppam---belonging to the Union Territory of Pondicherry were selected as cluster samples." The sample size was 263.

The sample farmers were contacted at their houses as well as farms to collect the data. In analysis of the data, mean scores and standard deviations were computed for all the statements regarding indigenous decision-making systems, indigenous knowledge systems, and indigenous technical practices to determine the extent of agreement, belief, and utilization respectively. A correlation analysis procedure was conducted to identify the relationship between selected indigenous technical practices and agricultural productivity and sustainability.

Findings

Participant farmers agreed most on the factor influencing indigenous decision-making that "farmers consult their neighbors before choosing a particular crop for planting". Seven of ten factors influencing indigenous decision-making systems received neutral ratings. Participant farmers strongly agreed with fifteen out of nineteen statements pertaining to indigenous knowledge on cropping systems. Farmers strongly agreed that "lodging in rice variety *ponni* leads to chaffy grains."

Participant farmers agreed with most of the statements in the areas of "indigenous crop nutrient management strategies" and "indigenous rice weed control techniques." Most of the indigenous technical practices pertaining to "indigenous rice seed selection and processing technique" received neutral ratings. Participant farmers disagreed only with three out of ten statements regarding "indigenous rice pest management strategies." Farmers disagreed with most of the statements in the area of "indigenous seed processing techniques." The mean scores on indigenous knowledge systems did not differ significantly with the three villages (Table 1).

As the use of sheep panning increased, the productivity of rice also increased (Table 2). With respect to groundnuts, as the use of indigenous intercultural operations increased, the productivity of groundnuts also increased. The indigenous technical practice, "sheep panning" was found to have a significant positive correlation with the sustainability factor "maintenance of soil fertility" on the one hand and negatively correlated with the sustainability factor, "external input usage" on the other. Use of "sheep panning" significantly decreased the "use of external inputs." As the use of "sheep panning" increased, "soil fertility" also increased.

The indigenous technical practice, "crop rotation" was found to have a positive correlation with the sustainability factor, "maintenance of soil fertility." The practice, "farm yard manure application" was negatively correlated with external input usage (Table 3). Not surprisingly, the indigenous practice, "supplementing stream water for irrigation" positively correlated with the sustainability factor "sustaining ground water resources." In other words, the rate of depletion of groundwater is slow in farm holdings where farmers supplemented the irrigation with stream water.

Table 1
Means and F-values Regarding the Extent to which Indigenous Technical Practices Were Being Used as Perceived by Farmers in Selected Villages of Pondicherry Region, India.

Indigenous technical practices		Villages		F-value	Prob.
	1	2	3		
	n=21	n=43	n=73		
Decision-making factors	4.50	3.75	3.84	.58	.56
Cropping systems	3.85	4.71	3.42	6.31	.00
Soil health care practices	4.28	3.60	2.68	1.89	.16
Rice seed processing techniques	2.63	3.43	3.89	1.24	.29
Rice transplanting techniques	4.85	4.39	4.53	.79	.41
Rice weed management strategies	3.71	2.43	3.01	.92	.37
Pest management strategies	4.33	4.49	4.61	.87	.47
Technical practices for groundnuts	3.63	3.49	3.19	.61	.58
Technical practices for tapioca	3.82	2.54	4.03	1.02	.18

1=Sivaranthakam
2=Kizhur
3=Pillayarkuppam

Table 2
Correlation Between Selected Indigenous Technical Practices and Productivity.

Indigenous technical practices	Yield
Farm yard manure application	.2482*
Row planting	.2897*
Pinch planting	.1903
Sheep panning	.4453**
Using rat traps	.2516*
Sowing on 15th of Tamil month *Karthigai*	.2830*
Intercultural operations	.2964*

**Significant at 0.01
* Significant at 0.05

Table 3
Correlation Between Selected Indigenous Technical Practices and Sustainability of the Agricultural System.

Indigenous Technical Practices	Sustainability factors		
	External inputs usage	Maintaining soil fertility	Sustaining ground water resources
Using rat traps	-.4564**	-.1120	.0934
Sheep panning	-.8660**	.2364*	-.1741
Crop rotation	-.1127	.4348**	.2382
Farm yard manure	-.3333**	.2124	-.0112
Using stream water for irrigation	.0986	-.1546	.7845**

**Significant at 0.01
* Significant at 0.05

Conclusions

The following conclusions were made based on this research study:

1. Indigenous knowledge is a viable means of technology transfer; there is much to be learned from indigenous knowledge systems of local people;

2. Devaluing indigenous knowledge systems as "low productive," "primitive," and "old" is no longer a useful attitude;

3. Recording indigenous knowledge systems is timely. If we are to move towards interactive technology dissemination from the conventional transfer of technology approach, it is feasible, efficient, and cost-effective to learn from these village-level experts;

4. Bringing a desirable change in the attitudes and behaviors of researchers and extension professionals stimulates the process of incorporating indigenous knowledge systems into agricultural research and extension;

5. Keeping indigenous knowledge as a foundation for action during the process of developing new technologies results in a basket of sustainable technological options rather than fixed packages;

6. Validating farmers' experiments creates an environment of respecting local people and village-level extension workers thus leading to their increased participation and empowerment; and

7. Using indigenous communication channels and farmer-to-farmer extension strategies increases the rate of dissemination and utilization of technologies that are built on indigenous knowledge (Mundy & Compton, 1991); and

8. Incorporating indigenous knowledge systems into agricultural extension and education organizations leads to an environment which respects local people thus leading to their increased participation and empowerment.

Recommendations .

The following recommendations were made based on the findings of the study:

1. Agricultural research scientists and extension professionals must be provided opportunities to learn the methodologies for systematically recording the indigenous agricultural knowledge available in every community.

2. A global-level training manual illustrating the methodologies of recording indigenous knowledge systems should be designed with the following components: (a) recording indigenous knowledge systems, (b) communicating indigenous knowledge systems, (c) evaluating indigenous knowledge systems, (d) integrating indigenous knowledge systems, and (e) disseminating and utilizing indigenous knowledge systems.

3. Identifying local people with specialized knowledge is important. It is essential to understand that a farmer may not be aware of all indigenous knowledge systems existing in his/her community. One farmer may be very knowledgeable about local landraces of food crops, their characteristics, and performance in his/her village. Another farmer may be highly knowledgeable about fodder trees and their performance in the village.

4. Agricultural and extension education policy-makers should develop strategies to cover more agricultural areas by incorporating indigenous knowledge systems.

5. Educating the younger generations of farmers and farm laborers on the values of agriculture as an occupation is essential. This would significantly improve the value of agriculture and allied activities such as manure collection and sheep panning.

6. Extension training for the region of Pondicherry should concentrate on: (a) introduction of new crops or varieties considering local problems and needs. Since crop theft is one of the major social problems, extension personnel should be trained in farmer group participatory methods while introducing new crops or varieties; and (b) sustaining groundwater resources.

7. The problem of crop thefts should be seriously dealt with. NGOs can play a leading role in this activity. Though farmers in the study villages are interested in diversifying their crop production from monocropping to multiple crop enterprises, crop theft acts as a great barrier for such a diversification.

8. Policy interventions to identify sheep herders and to encourage sheep panning activity is important. Younger generations of sheep herders need to be educated on the values of traditional sheep herding as an occupation. Local organizations must be geared up so that negotiations are carried out between farmers and sheep herders to avoid browsing problems.

9. Formation of local-level seed multiplication farms will solve problems in obtaining quality seeds. Specific extension educational programs must be developed to train extension workers regarding the methods to identify local seed growers, identification of appropriate varieties of seeds, and local procedures in managing the seed farms.

Implications

Farmers possess diversified knowledge regarding indigenous agricultural practices. In addition, farmers currently utilize these indigenous agricultural practices, however, in varying degrees. This research study made a significant attempt to quantify the ITPs in terms of their utilization, impact on productivity, and impact on sustainability. Such a quantitative evaluation of indigenous knowledge systems is a starting point to determine the role of indigenous knowledge systems in sustainable agricultural development. Exploring indigenous knowledge will be of immense value to extension administrators and research policy makers while preparing their extension programs and research agendas for a 21st century focused on sustainable agricultural development. Incorporating indigenous knowledge would also narrow the existing gap between agricultural extension professionals and farming communities.

References

Chambers, R. & Ghildyal, B. P. (1985). Agricultural Research for Resource-Poor Farmers: the Farmer-First-and-Last Model. Agricultural Administration and Extension, 20, 1-30.

Dvorak, K. A. (1988). Indigenous Soil Classification in Semi-Arid Tropical India. A Progress Report. Patencheru, India: International Crops Research Institute for Semi-arid Tropics (ICRISAT).

Ezaza, Q. P. (1989). The Main Environmental Issues and Options for the Sustainable Development of Agriculture Associated with the Use of Mineral Fertilizer and Agro-Chemicals. Journal of Eastern African Research and Development, 19, 73-82.

Hinkle, D., Wiersma, W. & Jurs, S. (1986). Applied Statistics for the Behavioral Sciences. Boston: Houghton Mifflin Company.

Mundy, P. & Compton, L. (1991). Indigenous Communication and Indigenous knowledge. Development Communication Report, 74(3), 1-3.

Rajasekaran, B. & Martin, R. A. (1990). Evaluating the Role of Farmers in Training and Visit Extension System in India. Paper presented at the Tenth Farming Systems Research/ Conference. East Lansing, Michigan, October 14-18, 1990.

Rajasekaran, B., Warren, D. M. % Babu, S. C. (1991). Indigenous Natural-Resource Management Systems for Sustainable Agricultural Development--A Global Perspective. Journal of International Development, 3(4), 387-402.

Rajasekaran, B. (1993). A Framework for Incorporating Indigenous Knowledge Systems into Agricultural Research and Extension Organizations for Sustainable Agricultural Development in India. Unpublished Doctoral Dissertation. Ames: Iowa State University.

Reijntjes, C., Haverkort, B., & Waters-Bayer, A. (1992). Farming for the Future: An Introduction to Low-External Input and Sustainable Agriculture. London: Macmillan.

Richards, P. (1986). Coping with Hunger: Hazards and Experiment in an African Rice-Farming System. London: London Research Series in Geography 11.

Warren, D. M. (1991a). The Role of Indigenous Knowledge in Facilitating the Agricultural Extension Process. Paper presented at International Workshop on Agricultural Knowledge Systems and the Role of Extension. Bad Boll, Germany, May 21-24, 1991.

Warren, D. M. (1991b.) Using Indigenous Knowledge in Agricultural Development. World Bank Discussion Paper No. 127. Washington, DC : The World Bank.

Warren, D. M. (1992.) A Preliminary Analysis of Indigenous Soil Classification and Management Systems in Four Ecozones of Nigeria. Discussion Paper RCMD 92/1. Ibadan, Nigeria: Resources and Crop Management Division (RCMD), International Institute of Tropical Agriculture.

PERCEPTIONS OF FARMERS REGARDING INDIGENOUS KNOWLEDGE SYSTEMS

A Critique

L. G. Schumacher, University of Missouri--Discussant

The researchers have addressed an important topic in this research. Far too often well-developed countries have tried to pass on information/education systems to third world countries without success because they failed to examine the indigenous knowledge systems.

The procedures and objectives were clear for this investigation. Data collection procedures could easily be replicated when determining indigenous knowledge systems of other developing countries.

Issues that should be addressed include identifying the statistical procedures used to select a sample of 263 from a population of 15,753. The importance of the cluster sampling technique was well noted. However, the number of farm households at each village is needed to ascertain if a sample size of 263 was appropriate. Table one indicates that an "n" of 137 was utilized when preparing this table. Was this the total number of farm household contacted?

It is not clear what qualifications and/or training the data collectors possessed. How were the data collectors trained to collect the data? Where each of the 106 statements read to the farmer? Or was the instrument delivered, administered, and assistance provided only as needed. Did one or several individuals travel to each farm household to collect the data?

The indigenous technical practice "cropping systems" was the only sub-section that was statistically significantly different (Table 1). Which village(s) were statistically different from each other? Do the researchers have any insight as to why this difference surfaced in the investigation?

I agree with the conclusions offered by the researchers. However, I am not certain whether or not the researchers where able to ascertain all of the conclusions from the data presented in the paper. For example, the conclusion "there is much to be learned from indigenous knowledge systems" does not appear to emanate from the findings.

The researchers should make a concise effort to define some of the concepts discussed in the paper. A brief concise definition of "indigenous knowledge systems" and "sheep panning" would be extremely helpful to the reader.

Congratulations on a very interesting, timely and well done piece of research.

READERSHIP SURVEY OF THE FFA NEW HORIZONS MAGAZINE

James J. Connors
Jack Elliot
Agricultural Education
The University of Arizona

David Krueger
Agricultural Education
Michigan State University

Introduction

In the past several years, numerous changes have occurred within agricultural education and the FFA. The agricultural education profession has moved from a predominantly production orientation to a more comprehensive agriscience focus; the Future Farmers of America is now named the National FFA Organization; the national headquarters has a new organizational structure and the National Future Farmer has become FFA New Horizons. These changes and others reflect and underscore the importance of understanding the various publics served by the FFA, an integral component of agricultural education. Understanding its audience is particularly true of the FFA New Horizons magazine, perhaps the most important public relations vehicle used by the National FFA Organization. In order to ensure the long-term efficacy of FFA New Horizons, its writers and editors must continually monitor readers' perceptions, attitudes and uses of the magazine.

The effectiveness of a publication greatly depends on how it reflects the interests of its readers. Unfortunately, the editor of a magazine has no easy way to obtain detailed and comprehensive feedback from the magazine's readers. A number of studies have shown that editors sometimes lack a clear perception of what their readers want (Wink, 1979). Letters to the editor are a common but unsystematic method of determining reader interest. They do not represent those readers who have strong opinions but do not care to write. Moreover, they tend to reflect attitudes and opinions about issues rather than perceptions about magazine form and content, per se. Attempts to gather readership data with survey research are rare (Wink, 1979).

According to Redding (1982), audience surveys can help maintain or open feedback channels so that a publication can remain responsive to its readers. Surveys enable editors and communications' managers to gather information about their audiences so they can more closely correlate editorial content to reader needs, expectations and interests (Dreyer, 1984; Tucker & Cooper, 1987; Suvedi et al., 1991).

A survey is a valuable tool in analyzing reader opinion. A well designed readership survey, based on sound research principles, can yield more reliable information than occasional letters and reader comments. Based on this information, editors can make their publications more effective.

Purpose and Objectives

This study was conducted to determine the appropriateness of FFA New Horizons to its readership. The specific objectives of the study were:

1. Determine demographic information of FFA New Horizons readers.

2. Ascertain readers' utilization of the FFA New Horizons magazine.

3. Identify the reading habits (kind and quantity of similar documents received) of FFA New Horizons clientele.

4. Determine readers' preferences for career development information in the FFA New Horizons magazine.

5. Determine FFA New Horizons value to its readers.

6. Determine differences among demographic data and reader preferences, reading habits and readers' utilization of FFA New Horizons magazine.

Procedures

The research design used for this study was a descriptive survey design. Four focus groups were used to assist in the development of the research instrument and to provide qualitative data for the study. The focus groups were designed to tap the experiences, skills or feelings of participants. A field test was conducted in October of 1991 with Michigan FFA members to assure the usability and validity of the technique. A month later, four focus groups convened during the 1991 National FFA Convention. The nominal group consisted of selected FFA members and advisors nominated by state supervisors for agricultural education. The results of the focus groups, coupled with the researchers' previous work in this area, provided the most relevant questions for the survey.

Validity of the survey instrument was established using a panel of experts that consisted of the FFA New Horizons' staff, the 1991-92 Michigan State FFA Officers, and faculty from the Department of Agricultural and Extension Education at Michigan State University. Reliability was established by a pilot test with a like group of FFA members and advisors not in the sample. Reliability coefficients ranged from .65 to .94.

Systematic random sampling was used to select 881 FFA members and 392 FFA advisors, from the FFA New Horizons' mailing list. The Total Design Method (TDM) (Dillman, 1978) was utilized. A mail questionnaire was used to collect data. The questionnaires were mailed to the sample population on February 14, 1992. A follow-up postcard was mailed one week later, followed by a second mailing of the questionnaire on March 2, 1992. A third follow-up mailing was sent to the non-respondents on March 18, 1992.

Data were analyzed using the Statistical Package for the Social Science (SPSS/PC+). The .05 level of significance was selected for use in interpreting the findings of the study. Frequencies, means, standard deviations, analysis of variance (ANOVA), and T-tests were used to analyze data.

Early and late respondents were compared to ensure generalizability to the population. Research has shown that late respondents are similar to non-respondents (Miller, 1983). Because there was no difference between early and late respondents, the results are generalizable to the population.

Findings

A total of 519 FFA members and 312 FFA advisors returned completed questionnaires for a combined response rate of 68% (61% FFA members and 80% FFA advisors). Because of missing data, totals do not always equal the number of respondents. Over 70% of the FFA members and 90% of the FFA advisors who responded to the survey were male. Females made up 29% of FFA members and 8% of FFA advisors who responded. An overwhelming number of FFA members and advisors reported their race as white. The mean age for FFA members was 16.5 years and 38 years for FFA advisors.

The FFA advisors averaged 14 years of teaching experience. Over 47% of the FFA members lived on a rural farm. Over 63% of the FFA advisors reported they taught in a rural school. The largest group of FFA members were sophomores in high school followed by juniors, seniors, graduates, freshmen, and finally 7th-8th graders. The largest group of FFA members had been members for 3 years.

The survey found that 78% of the FFA members and 81% of the FFA advisors read at least 50% of the magazine. Only 3.5% of the FFA members and 1.3% of the advisors did not read FFA New Horizons. Figure 1 illustrates what percentage of FFA New Horizons members and advisors read.

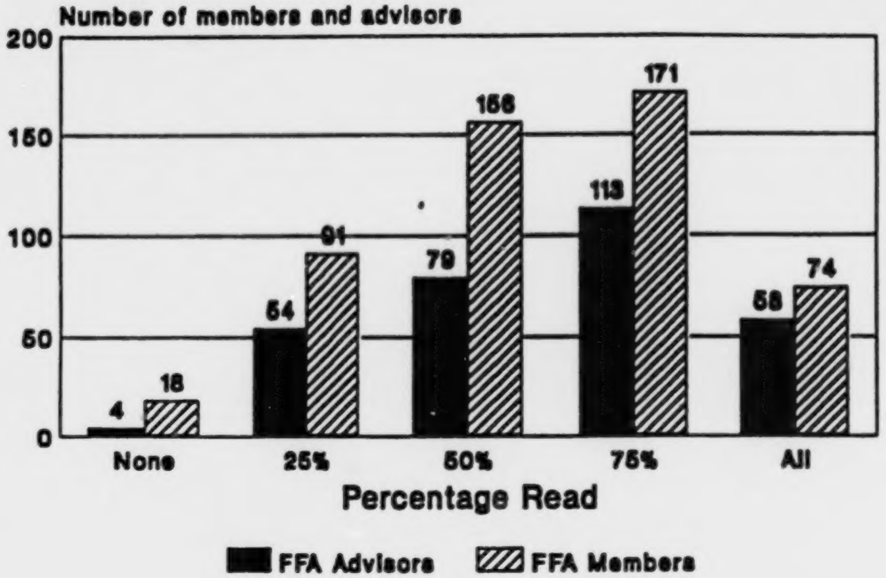


Figure 1
Percentage of FFA New Horizons read by FFA Members and Advisors (n=818)

Both FFA members and advisors responded that topics of personal interest, photographs, state topics, and article titles were quite important in determining which articles they will read. Article length, photograph captions, and regional topics were considered important by both FFA members and advisors when considering which articles to read.

When asked how often they read various sections, FFA members and advisors frequency read the cover story, features, FFA/career articles, "Chapter Scoop," and the joke page. FFA advisors indicated they frequently read "News in Brief," "Looking Ahead," "Front Line," "FFA in Action," and "My Turn." FFA members occasionally read these sections. Both FFA members and advisors occasionally read the "Mail Bag," and the advertisements.

The FFA members and advisors were asked to compare the FFA New Horizons magazine to other magazines they read. Respondents rated the magazine on a zero to 10 scale, with 10 being the high. Both FFA members and advisors rated the FFA New Horizons a seven when compared to other magazines they regularly read. FFA members were asked to indicate what other magazines they read. Table 1 shows the types of magazines FFA members listed.

Table 1
Other Magazines Read by FFA Members

TYPE OF MAGAZINE	NUMBER
Sports	270
Wildlife and natural resources	269
Agricultural/country	219
Youth	161
Entertainment	80
News	74
Women's magazines	19
Science	15
Family	10
Other types	143

FFA members and advisors both stated they would like more career information articles included in the magazine. Advisors also wanted to see more FFA success stories included in the magazine. Respondents were pleased with the amount of information on colleges/universities, urban articles, rural articles, national officer articles, and regional FFA information that is currently in the magazine. FFA advisors were unsure whether more FFA Alumni articles should be in the magazine.

FFA members and advisors would both like to see the number of issues of the FFA New Horizons magazine increased. Over 61% of the FFA members and 47% of the FFA advisors indicated they would like more issues of the FFA New Horizons magazine than they are currently receiving. Figure 2 shows the percentage of FFA members and advisors and the number of issues that they would like to receive.

Currently, $1.75 of FFA members' dues are designated to support the FFA New Horizons magazine. When asked how much additional dues they would pay to support the magazine, 89% of FFA members indicated they would pay at least $1.00 more dues. Over 59% of FFA advisors thought members would pay at least $1.00 more dues to support the magazine. Figure 3 shows the additional dues supported by FFA members and advisors.

The ANOVA found no significant difference between readers age, years of teaching or years in school, years in FFA, or grade level and their rating of the magazine. T-test found that there was a significant difference between the amount of extra dues female FFA members would pay and the amount male FFA members would pay.

FFA members and advisors had the opportunity to write additional comments about the FFA New Horizons magazine on the questionnaire. Comments were grouped into positive, negative, neutral, and other categories. Figure 4 shows the type of comments made by FFA members and advisors. A sample of the comments follows:

Positive Comments

"I really enjoy FFA New Horizons. I love reading it, and sharing it with family and friends."

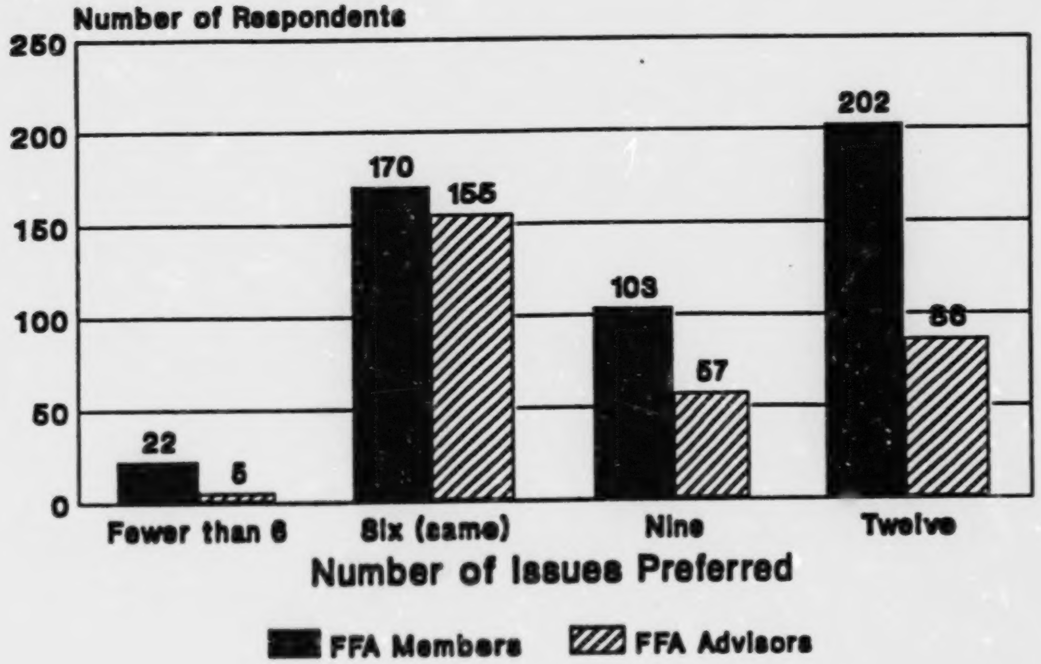


Figure 2
Number of Issues Preferred by FFA Members and Advisors

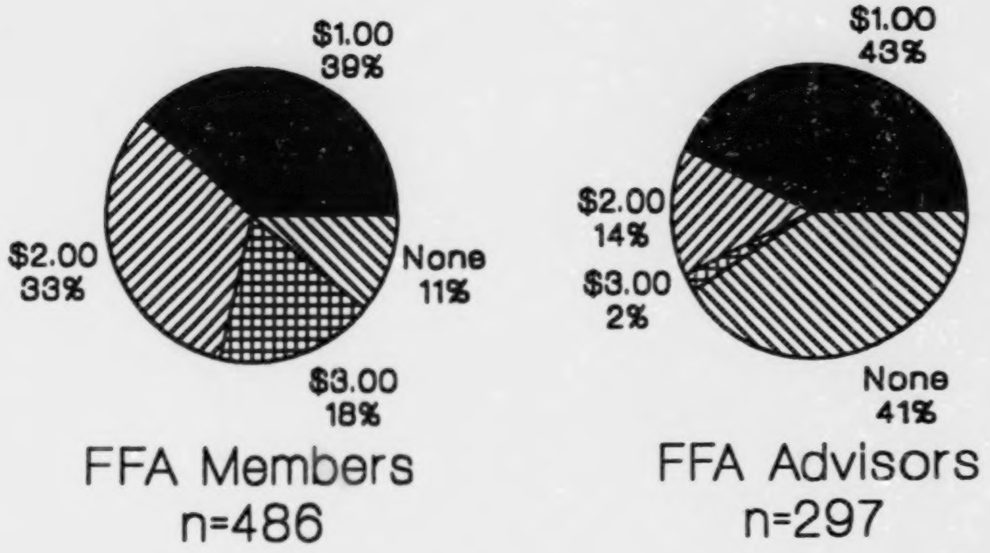


Figure 3
Additional Dues Supported by FFA Members and Advisors

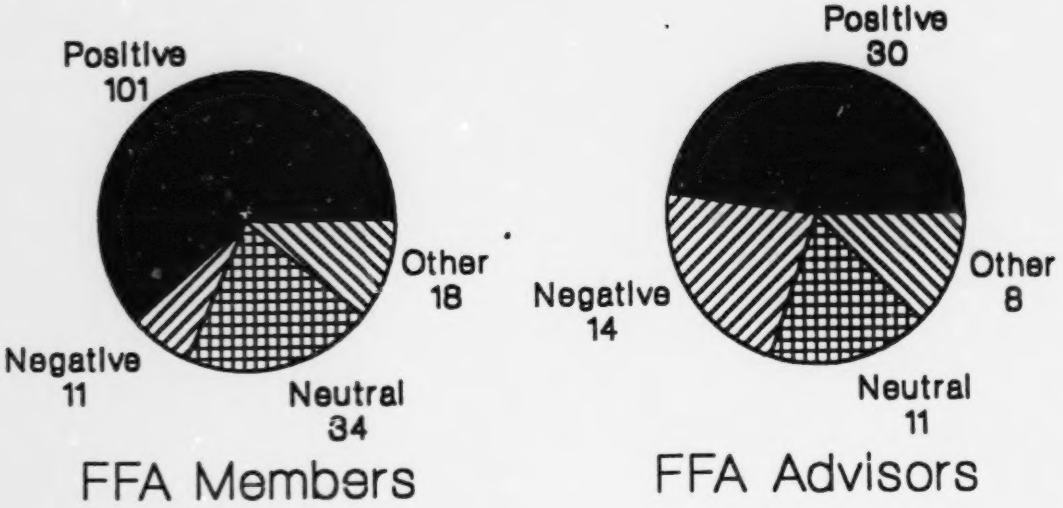


Figure 4.
Written Comments by FFA Members and Advisors

"I think the FFA New Horizons magazine is very educational and should be sent out to FFA members more often than just 6 times a year."

"Good magazine - needs to keep pace with changing FFA and kids needs. Recent articles on drugs and alcohol were good."

"I thoroughly enjoy the magazine. The articles on careers are usually good, especially when they are on 'nontraditional' careers."

Negative Comments

"I haven't received more than 4 magazines in 1.5 years."

"As the reporter of the ... HS Chapter of FFA, it was never made clear how to send articles in, or what to send."

"Students have a hard time relating to the magazine. They feel it is too 'rural.' But, they realize that comes with the territory and accept it."

"Members join the FFA in August - they receive their first magazine in February or March - Here's a problem you should address."

Neutral Comments

"Please send us the magazine, in Spanish, because our language is in Spanish."

"I would like to see a package deal to schools for classroom sets of 35."

Other Comments

"Every good magazine needs good advertising, to a point. Even in the beginning, Time had to have advertising, but now the name alone sells it."

"Gentlemen, if you'll notice, Sports Illustrated, Playboy and many magazines are getting more and more into video. You should to!"

Conclusions

The FFA New Horizons magazine is read extensively by both FFA members and advisors. FFA members and advisors prefer articles of personal, local, or state interest and would like to see more articles containing career information in the FFA New Horizons magazine. The writing quality, photographs, and paper quality were the highest rated components of the magazine's layout and design.

FFA members and advisors rated the FFA New Horizons magazine a 7 on a 10 point scale when compared to other magazines they usually read. FFA members and advisors would like to see the number of issues of the FFA New Horizons magazine increased. A large majority of FFA members indicated they would pay more dues to support the FFA New Horizons magazine.

Recommendations

FFA members and advisors should work with FFA New Horizons' staff to develop articles pertaining to local, state, and regional interests. FFA officials should also work with the FFA New Horizons' staff to initiate the process to increase FFA dues to support more issues of the magazine each year.

References

Dillman, D. A. (1978). Mail and telephone surveys: the total design method. New York: Wiley.

Dreyer, L. G. (1984). Readability and responsibility. Journal of reading, 27(4), 334-338.

Miller, L. E. & Smith, K. L. (1983). Handling nonresponse issues. Journal of Extension, 21, September/October, 22-23.

Reading, W. C. (1982). How to conduct a readership survey: a guide for organizational directors and communications managers. Chicago: Lawrence Ragan Comm., Inc.

SPSS Inc. (1987). Statistical package for the social sciences (SPSS/PC+). Chicago: Author.

Suvedi, M., Heinze, K. & Ferris, M. (1991). Michigan high school science teachers' perceptions of Futures magazine as a pedagogical resource and career exploration tool. Journal of applied communication, 75(1).

Tucker, M. & Cooper, B. (1987). Assessing reader interest: an Ohio study. The agricultural communication quarterly, 70(4).

Wink, L. (1979). A readership survey of ANR, the College of Agriculture and Natural Resources Alumni Association magazine. Unpublished master's thesis, East Lansing: Michigan State University.

READERSHIP SURVEY OF THE FFA NEW HORIZONS MAGAZINE

A Critique

L. G. Schumacher, University of Missouri--Discussant

The researchers are to be commended for designing an effective and efficient method to collect qualitative and quantitative data concerning the use of the FFA New Horizons magazine. The purpose and objectives were clearly stated. The procedures used to collect and analyze the data were appropriate.

Data collection procedures could easily be replicated to determine readership information from similar magazines.

Several questions surface while reading this paper. For example, what types of changes were needed when revising the instrument after the nominal group and pilot tests? Specifically, what magazines were given a higher rating? Such knowledge would cause one to examine these magazines closely for format and content.

Were males or females more willing to pay more dues for the privilege of receiving the FFA New Horizons? Which group wrote the largest number of "write-in" comments-- the advisors or the students? Or were the responding groups so similar that the data could be combined for reporting purposes?

A concern was raised because some members\advisors reported that they have only received 4 magazines in 1
/2 years. Did other members report similar problems? If so, this issue deserves some attention.

The authors are to be complimented on the reporting style employed involving the use of figures. This was particularly helpful to the reader.

Topic 1: Factors related to the decision to adopt or not adopt new technology

Authors: Jonathan C. Atherton, Joe G. Harper (Clemson University); Glen C. Shinn (Texas A&M University

Topic 1: Perceptions of university students about issues related to agriculture

Authors: Robert Terry, Jr., David E. Lawver (Texas Tech University)

Topic 1: Variables associated with attitudes of teachers toward computers in Korean secondary vocational agriculture

Authors: Seung Il Na, R. Kirby Barrick (Ohio State)

Topic 1: An evaluation of the leadership involvement of alumni from the Nebraska leadership education/action development program--A ten year followup study

Authors: Larry L. Andelt, Roy D. Dillon (University of Nebraska-Lincoln)

Topic 1: Perceptions of agricultural extension agents regarding agricultural biotechnology training and information needs

Authors: Robert A. Martin, E. Craig Williams (Iowa State University)

Topic 1: Effects of equipment maintenance and operation variables on energy use in the agricultural mechanics laboratory

Authors: Stanley Burke (Virginia Tech)

Topic 1: Characteristics of the dairy industry in the 21st century with implications for curriculum development in agricultural education

Authors: Gearl Collins (Green-Taliaferry Comp. HS), Maynard Iverson (University of Georgia)

FACTORS RELATED TO THE DECISION TO ADOPT OR NOT ADOPT NEW TECHNOLOGY

Jonathan C. Atherton
Agricultural Education
Clemson University

Joe G. Harper
Associate Professor
Ag Education and Ag
and Biological Engineering
Clemson University

Glen C. Shinn
Professor and Head
Agricultural Education
Texas A & M University

Introduction

A number of factors have underpinned the development of the current productive capacity of agriculture in the United States. At the top of this list are research and technological innovations (Bentley, 1986). Past research has produced technologies such as hybrid seed, improved cultural practices and chemical pest control. Widespread adoption of these technologies has resulted in an increased standard of living for producers and consumers alike. Dennis Avery (cited in Bentley, 1986), an analyst with the U. S. State Department, reported that during the four years from 1982 to 1985, "annual world production of grain and oilseeds has jumped by 213 million tons.... The largest share of the increase in crop output has been in the Third World" (p. 2). According to Bentley (1986), "Technology that allowed the United States to develop a productive agricultural industry is now being adopted much quicker by other countries" (p. 2).

While a number of factors contribute to the adoption of technologies, DePietro, Wiarda, and Fleischer (1990) provided a theoretical framework from which to begin. Their work documented organizational, technological and external environmental characteristics related to the decision to adopt new technologies. The organizational characteristics included the size of the organization, (DePietro, Wiarda, & Fleischer, 1990) centralization of decision making (Hage & Aiken, 1970; Daft & Becker, 1978), information processing (Galbraith, 1973; DePietro & Kuo, 1984; Dess & Oringer, 1987), management leadership behavior (Daft, 1982; DeMeyer, 1985), and the role of a product champion (Kolodny & Dresner, 1986). The technological characteristics included available technologies and current equipment and methods (DePietro, Wiarda, & Fleischer, 1990). Relevant external environmental characteristics included industry characteristics and suppliers of technology (Rees, Briggs, & Hicks, 1984).

From work done by Lionberger (1960) and Rogers (1983), individual characteristics were added to the theoretical framework. A primary individual characteristic identified by the works of Lionberger (1960) and Rogers (1983) was the decision making process as it related to innovations. In order to consider decision making, the investigation must include the thinking and learning process of adults. Kolb (1984) developed the learning styles inventory which provided insight into the preferred learning styles of potential adopters and gave insight into how instruction in new innovations should be structured and delivered to potential adopters of innovations.

If U. S. agriculture is to retain a competitive advantage, the adoption of appropriate new technologies must occur more efficiently. To facilitate the adoption of technology, a better understanding of variables related to the decision making process is needed.

Purpose and Objectives

The purpose of this investigation was to determine the relationships between the decision to adopt or reject a specific new technology (microcomputers) and the organizational, external environmental and personal characteristics of members of the South Carolina Young Farmer Education Association. Two primary objectives were addressed to: (1) determine the organizational, external environmental and personal characteristics and the decision made regarding the adoption of specific technology; and (2) determine the relationships between the characteristics measured and the decision made.

Procedures

The population was the membership of the South Carolina Young Farmer Education Association (N=575, 33 clusters). Membership was composed of adults enrolled in the regular adult education program taught in the public school. A cluster sample stratified by agricultural education district was employed to select the sample. The minimum sample size was calculated to be 8 clusters (Scheaffer, Mendenhall, & Ott, 1990). To insure adequate sample size, the number of clusters sampled was increased to 12. To equalize representation across the state, 3 clusters from each of the four districts in South Carolina were selected.

A survey instrument was used to collect data. The Total Design Method (TDM) developed by Dillman (1978) was used as a guide in the development of the instrumentation. Parts of the survey instrument were adapted from the instrument used by Bracewell, Persons, Lakjaa, and Chen (1992). The instrument was reviewed by a committee of technology transfer experts for content validity, criterion-related validity, and construct validity. Upon approval by the committee, the instrument was pilot tested. The pilot test resulted in clarification of two questions. The Kolb (1984) Learning Style Inventory (LSI) was used to collect data about the information processing preference of the individuals.

The twelve clusters to be sampled were purposively selected from the largest and most active chapters in each district, three from each of the four districts. One of these clusters chose not to participate and data from a second was not returned by the advisor within the time frame of the investigation leaving a total of 10 clusters from which data were collected. One hundred sixty-four young farmer members participated in the study. An on-site survey, conducted by the researcher, at the monthly meeting of each cluster selected was planned. Due to scheduling conflicts, it was necessary to mail a set of data collection instruments to four advisors and ask that they administer the instrument. The meetings of the remaining seven clusters were attended by the researcher who personally administered the instrument. These meetings took place between March 2, 1993 and April 7, 1993.

Analysis of Data

Means, standard deviations, and frequencies were used to describe the data set. Hypotheses tests were conducted using Chi Square tests of independence when the response was categorical; analysis of variance and t-tests were used when response variable was continuous. Several post hoc comparisons using z-tests to compare binomial proportions were conducted and the sequential Bonferroni method (Rice, 1989) was employed to control for both Type I and Type II error rates. All hypotheses were tested at alpha $p < .10$.

Results

The outcome of the decision making process was the response variable. The outcome was considered to be one of four possible decisions. The first possible decision was to make no decision. The participants were considered to have made no decision if they indicated "I have not made this decision" in the first section of the data collection instrument. Sixty nine (42%) of the respondents indicated they had made no decision. The second possible decision was a rejection of the technology, 28 (17%) of the respondents indicated rejection of the technology. The third possible decision was a planned adoption within one year, 26 (16%) of the respondents indicated they planned to adopt the technology within one year. The fourth possible decision was adoption, 41 (25%) of the respondents indicated they had adopted the technology.

The organizational, technological, external environmental and personal variables measured were tested for relationships with the decision made (see Table 1 for a summary of hypotheses tests).

Table 1
Summary of Statistical Tests for Relationships with the Decision Made

Independent Variable	Test Statistic	Value	p
Formal education	Contingency Table - Chi square	50.344	0.001*
Technology support	ANOVA Table - F	4.86	0.0031*
Age	ANOVA Table - F	3.07	0.0294*
Years of decision making	ANOVA Table - F	2.92	0.0361*
Management leadership	Contingency Table - Chi square	18.588	0.099*
Primary industry	Contingency Table - Chi square	18.815	0.222[1]
Organization size	Contingency Table - Chi square	14.868	0.460[2]
Gender	Contingency Table - Chi square	4.807	0.187
Centralization	Contingency Table - Chi square	5.981	0.425
Learning style	Contingency Table - Chi square	13.310	0.149
Visits by experts	ANOVA Table - F	0.99	0.3993
Economic orientation	Contingency Table - Chi square	3.623	0.305

Note: * Tested significant at p = .10.
1. Z-test for proportions found a significantly higher proportion of adopters and planned adopters within the dairy industry.
2. Z-test for proportions found a significantly higher proportion of adopters and planned adopters among those organizations with sales of $500,000 or higher.

Formal Education. Most frequently observed education levels were high school graduate, with 45 (28%), and Bachelors degree, with 45 (28%). The least frequent education level was professional degree, with one (0.6%). Literature suggested that earlier adopters tend to have more years of formal education than later adopters (Rogers, 1983). A chi square test of independence was used to determine if a relationship existed between the decision made and the educational level. The chi square test resulted in a calculated chi square statistic of 50.344 on 24 degrees of freedom (p = .001). The null hypothesis was rejected, indicating a relationship between the decision made and the education level completed. Post hoc comparisons using z-tests for proportions found generally a linear relationship: as the education level increased, the proportion of adopters and planned adopters increased.

Technology Support Infrastructure. This was measured by how many suppliers of technology the respondent was aware of within their general vicinity. The highest reported number was 15; the lowest number was none. The mean was 1.82 with a standard deviation of 2.63. Analysis of variance was used to determine if a relationship existed between the number suppliers of technology and the decision made. Literature suggested that access to suppliers increased the likelihood of adopting new technologies (DePietro, Wiarda, & Fleischer, 1990). The analysis of variance indicated a significant relationship (F = 4.86 on 3 and 130 degrees of freedom, p = .0031) between the variables. The means and standard errors of the number of suppliers were compared between the groups making each decision. Those who had adopted were aware of a significantly higher number of suppliers (2.9) than were those who had made no decision (0.85).

Age. The reported age ranged from a high of 76 years to a low of 17 years. The mean age was 41.2 years with a standard deviation of 13.8 years. Literature suggested that age had little effect on the adoption of technology (Rogers, 1986). An analysis of variance was conducted to determine if there was a relationship between the age of the subjects and the decision made. The analysis of variance resulted in a calculated F statistic of 3.07 on 3 and 158 degrees of freedom ($\underline{p} = .0294$). There was a difference in age between the groups making each decision. The means and standard errors of each group were compared. Those who had made the decision to adopt had a mean age of 36.4 years, which was significantly less than those who had made no decision (43.4 years) and had rejected (44.7 years). Those who planned to adopt had a mean age of 39.4 years which was not significantly different from any other decision.

Years of Decision Making. The number of years of decision making experience ranged from a high of 60 and a low of 1. The mean was 17.2 years with a standard deviation of 12.9 years. Literature suggested that experience in making decisions, and dealing with uncertainty, was related to the decision made (Lionberger & Gwin, 1991). An analysis of variance was conducted to determine if a relationship existed between the years of management experience and the decisions made. The analysis of variance resulted in a calculated F statistic of 2.92 on 3 and 151 degrees of freedom ($\underline{p} = .0361$). There was a difference in years of decision making by decision made. The means and standard errors of the years of experience of each group were compared indicating that those who had adopted (mean experience 12.6 years) had significantly less experience than those who had decided to reject (20.3 years) and those who had made no decision (19.3 years). Those who planned to adopt had a mean of 15.6 years of experience and were not significantly different from any other group.

Management Leadership Behavior. The characteristic used to determine management leadership behavior was goal setting for the future of the business. The participants were asked to indicate one of five possible levels of goal setting behaviors. The most frequent response (45%) was "unwritten goals, shared with others" followed by "written goals, shared with others" for 33% of the respondents. Thirteen, or 8.44%, indicated they did not develop goals for the future. Literature suggested a relationship between the level of management leadership behaviors and the adoption of technology (Daft, 1982; DeMeyer, 1985). A chi square test of independence was conducted to determine if a relationship existed. The chi square test resulted in a calculated chi square statistic of 18.588 on 12 degrees of freedom ($\underline{p} = .099$). The null hypothesis was rejected, lending support to the research hypothesis. There was a relationship between management leadership behaviors, as characterized by goal setting, and the decision made. Post hoc comparisons using z-tests for proportions found those who indicated "written goals, shared with others," "unwritten goals, shared with others," and "written goals, not shared" had a significantly higher proportion of adopters and planned adopters than those who indicated "unwritten goals, not shared," and "did not develop goals."

Industry Group. The participants indicated which of several industry groups they belonged in, based on their primary product. The largest group was livestock producers with 48, or 31% of those responding. The smallest group was fruit or vegetable producers, with 11, or 7% of those responding. Literature predicted there would be a relationship between the decision made and the primary industry group (DePietro, Wiarda, & Fleischer, 1990). To test this hypothesis, a chi square test of independence was conducted. The chi square test resulted in a calculated chi square statistic of 18.815 on 15 degrees of freedom ($\underline{p} = 0.222$). The null hypothesis was not rejected, indicating no relationship between the decision made and the primary industry group. Post hoc comparisons using z-tests for proportions found those in the dairy industry had a significantly higher proportion of adopters and planned adopters than the other primary industry groups.

Organization Size. The size of the agricultural business organization was determined by asking the respondents to classify themselves according to USDA gross income categories. The membership of the South Carolina Young Farmer Education Association tended to be made up of larger organizations than the national averages, with a smaller percentage of rural residence (38% compared to 65%), a larger percentage of small commercial (31% compared to 21%), a slightly larger percentage of moderate commercial (16% compared to 13%), a larger percentage of large commercial (7% compared to 1%), and a larger percentage of very large commercial (8% compared to 0.5%). Literature predicted a strong relationship between the adoption of technology and the size of the organization (DePietro, Wiarda, & Fleischer, 1990). A chi square test of independence was conducted to determine if a relationship existed between the organization size and the decision made. The chi square test resulted in a calculated chi-square statistic of 11.828 on 12 degrees of freedom ($\underline{p} = 0.460$). The null hypothesis was not rejected. There was no overall relationship between the decision made and the size of the organization. Post hoc comparisons using z-tests for proportions found a significantly higher proportion of adopters and planned adopters among those with gross sales of $500,000 and higher (large commercial and very large commercial).

Factors Showing No Relationship Hypothesis tests were conducted on several other factors identified by current literature as being related to the adoption process, each was found to have no relationship in this investigation. Centralization of decision making had no relationship with the decision made. The information processing style, as measured by the Kolb LSI, had no relationship with the decision made. The number of visits made by external experts (product champions), was not different between the groups who have made the various decisions. There was no relationship between gender and the decision made. No relationship was found between economic orientation and the decision made.

Conclusions and Recommendations

Several of the variables included in this investigation were found to be related to the decision to adopt innovations. The level of formal education had the strongest relationship and supports work done by Rogers (1983). The technology support infrastructure was found to be related to the decision made and supports the work done by Rees, Briggs, and Hicks (1984). The age of the decision maker had a negative relationship with the decision to adopt which was in contrast to work done by Rogers (1983) who predicted no relationship with adoption and age. The number of years of decision making experience was also negatively related to the decision to adopt, supporting Lionberger and Gwin (1991) who suggested that the length of management experience influences adoption. Support was also found for Daft (1982) and DeMeyer (1985) who found that planning and goal setting positively influenced adoption. A relationship was also found between the decision made and the size of the organization, supporting the work of DePietro, Wiarda, and Fleischer (1990).

Of the variables showing no relationship with the decision to adopt, all conflict with current literature. Rogers (1983) predicted that gender was related to adoption, this was not the case in this investigation. Centralization of decision making was not related to the adoption decision as was suggested by Hage and Aiken (1970) and Daft and Becker (1978). The information processing style showed no relationship with the decision made, conflicting with the theories of Galbraith (1973), DePietro and Kuo (1984), and Dess and Oringer (1987). The number of visits by external experts also showed no relationship with the decision made, conflicting with the work of Kolodny and Dresner (1986). No relationship was found between the economic orientation of the manager and the decision made as was suggested by Rogers (1983).

As a result of this investigation, several recommendations have been formulated to enhance the adoption diffusion process. This recommendations should be considered when planning and delivering adult instruction in agriculture.

1. Encourage membership and participation across a broad range of education levels, encourage interaction among members through a variety of educational experiences including the use of those with higher education levels as resources to those with lower education levels.

2. Develop a network of suppliers of technology and make both the suppliers and members of adult classes aware of the needs and appropriate innovations.

3. Encourage participation of younger members and those with fewer years of decision making experience. Develop educational activities where the younger members can learn from those with more experience.

4. Members of adult classes should include instruction in business planning and goal setting skills. Written goals should be developed and shared within the business organization and progress toward meeting those goals should be measured. Where appropriate, goals should be shared among other adult members. Instructional time should be allocated to develop and communicate these goals.

5. Encourage participation in the adult education program by a variety of industry groups to share experiences and provide technological leadership.

6. Encourage large commercial and very large commercial producers to be involved in the adult education program to share experiences and decision making skills.

References

Bentley, O. G. (1986). Role of research in agriculture. In (USDA) 1986 yearbook of agriculture: Research for tomorrow. Washington, DC: USDA Office of Public Affairs, pp. 2 - 11.

Bracewell, E. W., Persons, E. A., Lakjaa, A., & Chen, C. (1992). Innovation diffusion and decision making by Minnesota dairy farmers. St. Paul: University of Minnesota.

Daft, R. L. (1982). Bureaucratic versus nonbureaucratic structure and the process of innovation and change. In S. B. Bachrach (Ed.) Research in the Society of Organizations, 1, 129-166. Greenwich, CT: JAI Press Inc.

Daft, R. L. & Becker, S. W. (1978). The innovative organization. New York: Elsevier.

DeMeyer, A. C. L. (1985). The flow of technological innovation in an R&D department. Research Policy, 14, 315-328.

DePietro, R. & Kuo, C. (1984). The resiliency of organizational information systems and organizational performance in a high technology firm. A paper presented at the International Communication Association Conference, San Francisco.

DePietro, R., Wiarda, E., & Fleischer, M. (1990). The context for change: Organization, technology, and environment. In L. G. Tornatzky & M. Fleischer (Eds.), The process of technological change (pp. 151 -175). Lexington, MA: D. C. Heath and Company.

Dess, G. G. & Oringer, N. K. (1987). Environment, structure, and consensus. Academy of Management Review, 12(2), pp. 313-330.

Dillman, D. (1978). Mail and telephone surveys: The total design method. New York: John Wiley & Sons, Inc.

Galbraith, J. R. (1973). Designing complex organizations. Reading, MA: Addison-Wesley.

Hage, J. & Aiken, M. (1970). Social change in complex organizations. New York: Random House.

Kolb, D. A. (1984). Experiential learning: Experience as the source of learning and development. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Kolodny, H. & Dresner, B. (1986). Linking arrangements and new work designs. Organizational Dynamics, 14(4), 33-51.

Lionberger, H. F. (1960). Adoption of new ideas and practices. Ames: Iowa State University Press.

Lionberger, H. F. & Gwin, P. H. (1991). Technology transfer ... from researchers to users. Columbia: University of Missouri.

Rees, J., Briggs, R., & Hicks, D. (1984). New technology in the American machinery industry: Trends and implications. A study prepared for the use of the Joint Economic Committee, Congress of the United States. Washington, DC: U.S. Government Printing Office.

Rice, W. R. (1989). Analyzing tables of statistical tests. Evolution, 43(1), pp. 223-225.

Rogers, E. M. (1983). Diffusion of innovations. New York: Free Press.

Scheaffer, R. L., Mendenhall, W., & Ott, L. (1990). Elementary survey sampling (4th ed.). Boston: PWS-KENT Publishing Company.

PERCEPTIONS OF UNIVERSITY STUDENTS ABOUT ISSUES RELATED TO AGRICULTURE

Robert Terry, Jr. David E. Lawver
Assistant Professor Assistant Professor
Department of Agricultural Education and Communications
Texas Tech University

Introduction

Much attention has been given to the fact that American society is "agriculturally ignorant." Coon and Cantrell (1985) pointed out, "Today, the public's image of agriculture is a kaleidoscope of leftover attitudes and images of what agriculture was in the '40's, '50's, and early '60's" (p. 22). While newly developed agricultural literacy programs have been designed to improve such images, there are other factors that might cause agriculture to have a less than appealing image.

Urbanization of the population of the United States has contributed to inaccurate perceptions and low awareness about agriculture. Sorenson (1987) stated that as our population continues to shift to cities, fewer Americans are likely to have contact with production agriculture. Because most people in this country do not have to be concerned about the supply of high quality food and fiber, many fail to understand its benefits to our society (USDA, 1983).

Some of the most controversial topics currently being considered in our society involve agriculture. Today, special interest groups have been organized concerning issues such as food safety, animal welfare, and the environment. These groups are often well funded, have celebrity spokespersons, and receive a great deal of attention from the media. The efforts of these groups and their members have brought about changes in agricultural practices and policies if not in the perceptions that the general public has about the industry (Watson, 1991; Howard, 1991; Paschall, Hollingsworth, Craig et al, 1992).

Several agricultural groups have taken the offensive to counter-act the messages of animal rights and environmental activist groups (Warner, 1991; Culliton, 1991). Agricultural literacy programs also include objectives to inform a variety of audiences about the ways in which food and fiber producers treat animals ethically and work in harmony with the environment while providing safe and healthy products.

It is vital that the general public have accurate perceptions about agriculture for several reasons. Agriculture is important because of its impact upon society, the economy, the environment and personal health. University students represent the next generation of policy-makers. It is important to understand their perceptions regarding issues related to agriculture so that educational programs might be designed to meet their needs. Therefore, the problem of this study was: Considering the negative attention that has been directed towards agriculture and the social changes that have taken place in the United States, how do university students perceive controversial issues related to agriculture?

Purposes and Objectives

The purpose of this study was to determine the perceptions of university students regarding controversial issues related to agriculture and how the students' demographic characteristics are associated with those perceptions. The following objectives were formulated to accomplish the purpose.

1. Identify selected demographic characteristics of university students.

2. Determine perceptions of university students regarding controversial issues related to agriculture.

3. Identify demographic characteristics associated with university students' perceptions concerning controversial issues related to agriculture.

Methods and Procedures

The population of this study was all students enrolled at Texas Tech University during the spring semester of 1992. The University has an enrollment of approximately 24,600 students in seven colleges and two professional schools (medicine and law).

A sample of 400 students was selected which exceeded the minimum sample for a population of this size suggested by Krejcie and Morgan (1970). Using procedures proposed by Dillman (1978), a random sample was drawn from the Texas Tech University 1991-92 Telephone Directory.

The instrument used to collect the data was a questionnaire designed by the researchers. Part I consisted of questions pertaining to demographic characteristics of the students. These characteristics included: College (Agricultural Sciences, Architecture, Arts and Sciences, Business Administration, Education, Engineering, Home Economics, Law, Medicine), Classification (Freshman, Sophomore, Junior, Senior, Graduate), Age (20 or younger, 21-22, 23-25, 26 and older), Hometown (Farm or Ranch, Country but not a Farm or Ranch, Town of less than 5,000 residents, City of 5,000 50,000 residents, City of 50,000 to 1 million residents, Metropolitan of more than 1 million residents), Ethnicity (African-American, Asian-American, Hispanic-American, Native American, White American, International Student), and Gender.

Part II was composed of questions addressing controversial issues related to agriculture with 5-point, Likert-type scaled responses. The choices were: 1= strongly disagree, 2=disagree, 3=neutral or undecided, 4=agree, 5=strongly agree. Faculty of the College of Agricultural Sciences at Texas Tech University were solicited to provide topics and questions concerning issues in their field. At least one faculty from each department contributed to the study.

Validity and reliability of the instrument were assessed by a panel of experts composed of faculty from the College of Agricultural Sciences and a pilot test was conducted. Following the data collection, a Cronbach's alpha of .87 was calculated on the items in Part II.

Data were collected via telephone using procedures suggested by Dillman (1978). Ten agricultural communications students were hired to administer the questionnaire with each caller assigned to obtain 40 responses. Correlation coefficients were calculated between the variable "caller" and all other variables. The caller variable was found to have no more than a .19 correlation with any of the other variables and most correlations were found to be negligible.

Statistical analysis was completed using SPSS for the Macintosh. Means, standard deviations and correlation coefficients were computed for each item.

Factor analysis was performed on the responses to the items in Part II of the questionnaire. According to Kim and Mueller (1978), a scree test can be used to determine the number of factors to be extracted. In this case, five factors were extracted. Items were grouped into the five factors based upon their factor loading using an orthogonal rotation. Items with a loading of less than .50 were eliminated.

Upon examination of the factor loadings, each of the five factors were named. The factors were named as follows: Food Safety, Animal Welfare, Farming Practices, Animal Medications, and Impact of Agriculture. To obtain a factor score for further analysis, an average was computed for each factor. Table 1 contains the items in each factor and the loading for each.

Table 1
Means, Standard Deviations and Factor Loadings for Each Factor

Factor/ Item	Mean	S.D.	Factor Loading
Food Safety	4.14	0.52	
Vegetables like celery, carrots & potatoes are safe to eat.	4.23	0.54	.84
Fruits like apples, peaches, & oranges are safe to eat.	4.22	0.56	.81
Milk and dairy products are safe to eat	4.16	0.59	.77
Fish, chicken and turkey are safe to eat.	4.11	0.68	.76
Red meats like beef, lamb and pork are safe to eat.	3.97	0.76	.66
Animal Welfare	3.14	0.79	
It is okay to use animals for research to discover or test medications to help humans.	3.79	1.04	.75
Animals used for the production of food are treated in a humane way.	3.38	0.98	.61
Research animals are treated in a humane way.	2.98	1.10	.72
It is okay to use animals to test make-up soaps, and cleansers.	2.83	1.21	.51
It is okay to produce animals primarily for their hide or fur to be used for products like fur coats.	2.73	1.15	.67
Farming/Ranching Practices	2.85	0.65	
Methods used to raise livestock and grow crops do not have detrimental effects on land, air and water.	3.24	0.94	.55
I would pay more for food that has not been treated with any chemicals or hormones.	2.83	0.56	.68
I try to buy foods labeled "organic" or "natural."	2.87	0.99	.59
Farmers and ranchers use an appropriate amount of chemicals to grow their products.	2.96	0.87	.63
Agricultural production practices need not be changed to care for the environment.	2.45	1.01	.63
Animal Medications	3.31	0.73	
It is okay to give animals medication to help them grow fast and stay healthy.	3.68	0.86	.58
It is okay to give hormones to animals produced for their meat to help them grow fast and stay healthy.	3.19	0.99	.69
The use of artificially introduced hormones should not be banned.	3.08	1.00	.63
Impact of Agriculture	4.42	0.52	
Agriculture is an important contributor to our economy	4.52	0.61	.68
Farmers and ranchers care about the environment.	4.32	0.67	.70

Correlation coefficients, oneway analysis of variance.(ANOVA) and stepwise multiple regression were employed to analyze the relationships between and among variables. The Modified LSD post hoc test was used to identify differing variables detected by the ANOVA procedures. An alpha level of $p < .05$ was used on all tests.

Results

A total of 390 usable responses were obtained for a response rate of 97.5%. The demographic characteristics of the respondents indicated that the sample was representative of the population. Each classification, ethic group and gender were appropriately represented. Likewise, there was appropriate distribution of the students by college as illustrated in Figure 1.

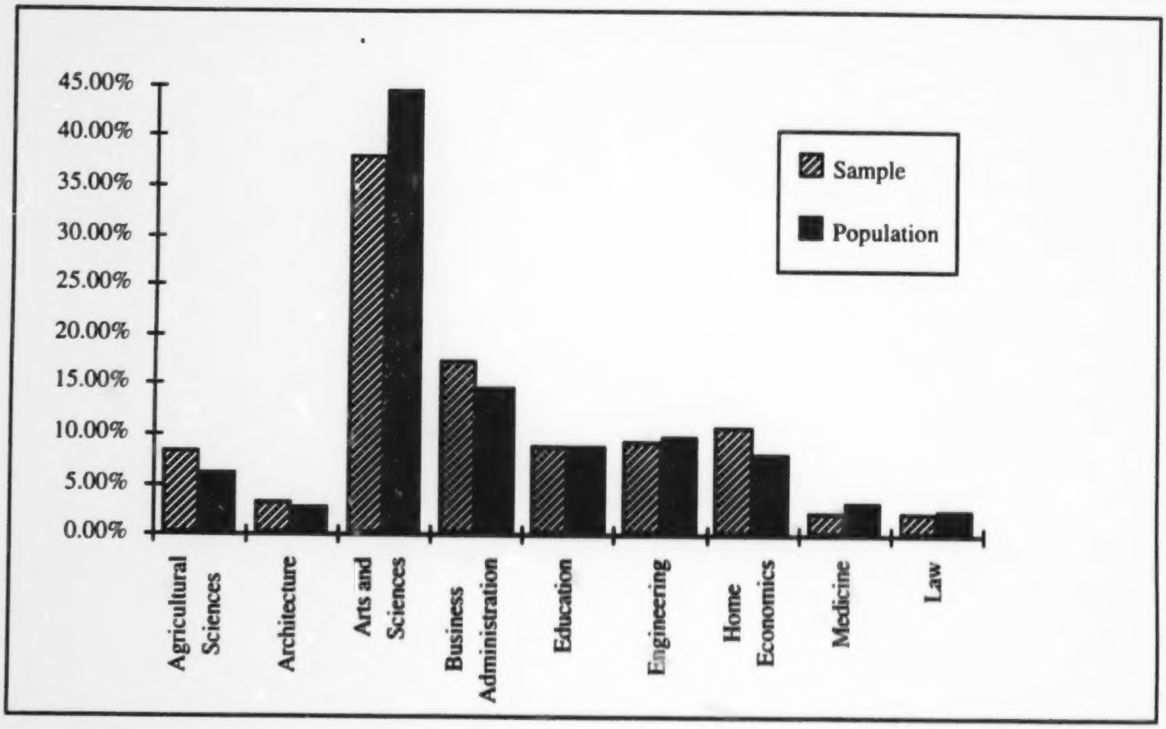


Figure 1
Comparison of Distribution of Sample and Population by College

Over all, university students agreed that their food is safe to eat. The Food Safety factor had a mean of 4.14 on the five point Likert-type scale. They also agreed with the items in the Impact of Agriculture factor (4.42) indicating they were positive about the role of agriculture on our economy and the environment.

The student body was neutral or undecided concerning the Animal Welfare, Farming/ Ranching Practices, and Animal Medication factors. The means for Animal Welfare (3.14) and Animal Medication (3.31) were above the midpoint of the scale and the mean for Farming/ Ranching Practices (2.85) was below the midpoint of the scale. Table 1 reports the means and standard deviations for each factor.

The analysis of each factor by college in which respondents were enrolled indicated that students enrolled in the College of Agricultural Sciences were significantly different than students from one or more of the other colleges on each factor (Table 2). Agriculture students had more favorable perceptions of food safety, animal welfare, farming/ranching practices, and animal medications, than did students in the College of Arts and Sciences. Agriculture students differed from engineering students on the food safety factor, from architecture students on animal welfare, from home economics students on farming/ranching practices, from medical students on animal medicine, and from business administration students on the impact of agriculture. No significant differences were found on any factors between agriculture students and students in the College of Education or the School of Law.

Table 2
Factors Where Significant Differences Were Found by College

College	1	2	3	4	5	6	7	8	9
Agricultural Sciences (1)		b	a,b,c,d	e		a		c	d
Architecture (2)									
Arts and Sciences (3)									
Business Adm. (4)									
Education (5)									
Engineering (6)									
Home Economics (7)									
Medicine (8)									
Law (9)									

* $p < .05$
modified LSD post hoc test used
a = food safety, b = animal welfare, c = farming/ranching practices, d = animal medication, e = impact of agriculture.

The analysis of variance by classification showed significant differences between juniors and seniors on food safety. There was a significant difference between students less than 20 years of age and those ages 20 to 22 on the animal welfare factor with the younger students having more favorable perceptions. There were no other differences in perceptions about any of the factors between the other age classifications or ethnic groups.

When the factors were compared by hometown, students who were from a farm or ranch had significantly more favorable perceptions food safety and animal welfare than did students from communities of less than 5,000 to more than 1 million. They were also more favorable about farming and ranching practices than students from cities of 5, 000 or more, and more favorable about the impact of agriculture than students from cities of 50,000 or more (Table 3).

Males and females differed on each of the five factors. Males had more favorable perceptions about each factor except farming practices. Table 4 shows the results of the post hoc test.

Stepwise multiple regression revealed that one or more of the students' demographic characteristics explained a significant portion of the variance associated with each of the five factors. Hometown explained by far the greatest amount of the variance for every factor except Animal Medication. For each of these four factors, gender explained the second greatest portion of the variance.

Table 3
Factors Where Significant Differences Were Found by Hometown.

Hometown	1	2	3	4	5	6
Farm or Ranch (1)			a,b	a,b,c	a,b,c,e	a,b,c,e
Country, but not a Farm or Ranch (2)						
Town of less than 5, 000 (3)						
City of 5,000 to 50,000(4)						
City of 50,000 to 1 million (5)						
Metropolitan of more than 1 million (6)						

* p < .05
modified LSD post hoc test used
a = food safety, b = animal welfare, c = farming/ranching practices, d = animal medication, e = impact of agriculture.

Table 4
Analysis of Variance of Factors by Gender.

Factor	Mean score by gender Females	Mean score by gender Males	F	p
Food safety	4.08	4.19	4.95	.0266*
Animal welfare	2.99	3.28	12.87	.0004*
Farming/ranching practices	2.76	2.93	6.093	.0140*
Animal medication	3.11	3.50	29.65	.0000*
Impact of agriculture	4.50	4.35	7.56	.0063*

* p <.05

Hometown and gender explained 6.84% of the variance associated with the Food Safety factor, 8.37% associated with the Animal Welfare factor, 6.60% of the variance associated with the Farming/Ranching Practices factor, and 4.60% of the variance associated with the Impact of Agriculture factor.

For the Animal Medication factor, gender (7.10%), college (1.63%), and hometown (1.24%) explained nearly 10% of the variance (see Table 5).

Table 5

Stepwise Regression Analysis of Students' Characteristics on Each Factor.

Dependent Variable/ Independent Variable	R	R^2	R^2 Change	df	F
Food safety					
Hometown[a]	.2407	.0579	.0579	(1,388)	23.86*
Gender[b]	.2616	.0684	.0105	(2,387)	14.21*
Animal Welfare					
Hometown[a]	.2344	.0550	.0550	(1,388)	22.57*
Gender[b]	.2893	.0837	.0287	(2,387)	17.63*
Farming/Ranch Practices					
Hometown[a]	.2298	.0528	.0528	(1,388)	21.26*
Gender[b]	.2569	.0660	.0132	(2,387)	13.67*
Animal Medication					
Gender[b]	.2665	.0710	.0710	(1,388)	29.65*
College[c]	.2954	.0873	.0163	(2,387)	18.50*
Hometown[a]	.3158	.0997	.0124	(3,386)	14.25*
Impact of Agriculture					
Hometown[a]	.1580	.0250	.0250	(1,388)	9.93*
Gender[b]	.2144	.0460	.0210	(2,387)	9.92*

* $p < .05$

[a] Hometown coded: 1=farm or ranch, 2=country, not a farm or ranch, 3=town < 5, 000, 4= small city 5,000-50, 000, 5=city 50, 000 to 1 million, 6=metropolitan more than 1 million.

[b] gender coded: 1=female, 2=male.

[c] College coded: 1=Agri. Sciences, 2=Arch., 3=Arts & Sciences, 4=Business Adm., 5= Education, 6=Engineering, 7=Home Econ., 8=Medicine, 9=Law.

Conclusions

1. Overall, university students perceive the food supply to be safe to eat and that agriculture has a positive impact on our economy and environment.

2. University students have neutral or undecided perceptions concerning animal welfare, farming and ranching practices, and the use of medications on animals.

3. Students from the School of Law and College of Education tended to have the same perceptions as did students from the College of Agricultural Sciences. Students from all other colleges tended to differ from students from the College of Agricultural Sciences on one or more factors.

4. Male university students have more positive perceptions about food safety, animal welfare, farming and ranching practices, and the use of medications on animals than do their female counterparts.

5. Of the demographic characteristics studied, hometown and gender explain the greatest amount of variation associated with students' perceptions about food safety, animal welfare, and farming and ranching practices.

6. Of the demographic characteristics studied, gender, college, and hometown explain the greatest amount of variation associated with students' perceptions about the use of medications on animals.

Recommendations

1. Students enrolled in colleges other than the College of Agricultural Sciences, the School of Law, and College of Education should be provided with accurate information concerning controversial issues related to agriculture, particularly in the areas of animal welfare, farming and ranching practices, the use of medications on animals, and the impact of agriculture on our economy and the environment.

2. Programs to inform university students about controversial issues related to agriculture should be designed to target students from cities and metropolitan areas and females. Such programs might be conduced through programs such as an Agriculture Week on campus and through service courses.

3. A study should be conducted to determine why students from the College of Agricultural Sciences have similar perceptions to students from the School of Law and College of Education.

4. A study similar to this one should be conducted with university students from other regions of the nation and on campuses with out a college of agriculture.

References

Coon, T. K. & Cantrell, M. J. (1985). Agriculture in black and white. The Agricultural Education Magazine, 58(4), 22-23.

Culliton, B. J. (1991). Can reason defeat unreason? Nature, 351(6327), 517.

Dillman, D. A. (1978). Mail and telephone surveys: The total design method. New York: John Wiley and Sons.

Howard, W. E. (1991). Animal rights vs. hunters. Outdoor Life, 187(4), 110-111.

Kim, J. & Mueller, C. W. (1978). Factor analysis: Statistical method and practical issues. Beverly Hills, CA: Sage Publications.

Krejcie, R. V. & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30, 607-610.

Paschall, M. J. & Hollingsworth, C., et al. (1992). Working the bugs out. American Dietetic Association Journal, 92(8), 931.

Sorenson, D. D. (1987). How to keep 'em on the farm and farming. The American School Board Journal, 174, 6-28.

United States Department of Agriculture, Office of Governmental and Public Affairs, Office of Information. (1987). Resource guide to educational materials about agriculture: A project of Agriculture in the Classroom. Washington, DC: Author.

Warner, D. (1991). The food industry takes the offensive. Nation's Business, 79(7), 42-45.

Watson, K. (1991). Downers are out. Farm Journal (Midwest Edition), 115(10), 22.

VARIABLES ASSOCIATED WITH ATTITUDES OF TEACHERS TOWARD COMPUTERS IN KOREAN SECONDARY VOCATIONAL AGRICULTURE PROGRAMS

Seung Il Na, Adjunct Assistant Professor
R. Kirby Barrick, Professor & Chair
Department of Agricultural Education
The Ohio State University

Introduction

Agriculture teachers have been expected to integrate computing into their programs since the early 1980s (Camp, 1983). Computers are invading the classroom. Teachers are the ones who can sensibly and realistically best determine how computers may be used in the classroom. Agricultural educators must be prepared to use computers to their fullest potential (Becker & Shoup, 1985). Research has shown that over 90% of all schools and 73% of all agriculture programs in the United States have access to computers (Birkenholz & Stewart, 1991). In Korea, all secondary vocational agriculture programs have access to computers. The Ministry of Korean Education has provided agricultural teachers with computer training since vocational agriculture programs integrated computer technology into curriculum. Nevertheless, approximately one out of seven vocational agriculture teachers uses a computer in his or her work.

Attitudes have been found to predict adoption behavior of new technologies (Anderson, Hansen, Johnson, & Klassen, 1979). Research has shown that successful implementation of computers in education depends on teachers' attitudes toward computers (Woodrow, 1991; Koohang, 1989; Hunter & DeLeeuw, 1988; DelFrate, 1987; Manarino-Lettett & Cotton, 1985; Gressard & Loyd, 1985b; Keenhan, 1983; Lawton & Gerschner, 1982; Stevens, 1980) and their levels of expertise with computers (Manarino-Lettett & Cotton, 1985; Stevens, 1980). If teachers regard computers negatively or with suspicion, the educational utilization of computers will be limited (Randhawa & Hunt, 1984).

An awareness of the attitudes of teachers toward computers is important (Steward, 1990). Beck (1979), Hallworth and Brebner (1980), Stevens (1980), Clement (1981), Keenhan (1983), and DelFrate (1987) have stressed the need for determining attitudes of teachers toward computers in education. Most research on computer use in agricultural education has been focused in three general areas: competencies needed by teachers, current status of computer use, and instructional effectiveness of using computers in education (Camp & Sutphin, 1991). However, there have been no studies on variables associated with attitudes of agricultural teachers toward computers in vocational agriculture programs in Korea or the United States.

Computer training may increase the knowledge and skills of teachers regarding the use of computers in education, and may also contribute to reductions in computer anxiety. Training may also influence a teacher's attitude toward computers in education. Computer anxiety may contribute to negative attitudes toward computers in education, and the availability of computers may be related to teacher attitudes toward computers. Research has reported that a teacher's computer attitude cannot be attributed to lack of training, lack of knowledge, or lack of computers. In addition, some personal and school characteristics may be related to computer attitudes. The relationships between these variables and the computer attitude of agricultural teachers are unclear.

A Conceptual Framework

There are many factors that influence the attitudes of teachers toward computers in education. Based on the review of literature, the researchers proposed a conceptual framework about attitude toward computers in education (Figure 1). Computer training increases computer

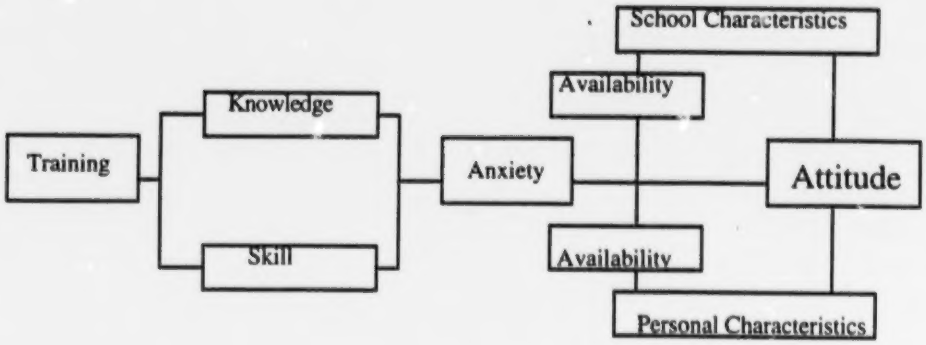


Figure 1
A Theoretical Framework about Attitude toward Computers in Education

competence and knowledge (Price, 1986; Madsen & Sebastiani, 1987), decreases computer anxiety (Price, 1986; Johnson, 1987; Fletcher & Deeds, 1992), and increases positive attitudes toward computers (Price, 1986; Madsen & Sebastiani, 1987). Training in the use of computers influences a teacher's attitude toward computers (Martin, 1984; Carey, 1985; Gressard & Loyd, 1985b; Anderson, 1986; Slowiczek, 1989). However, Woodrow (1987) stated that a positive attitude toward computers is not the only product of extensive training in computers.

As teachers' knowledge about computers increases, their attitudes towards computers also become more positive (Woodrow, 1990) and they have less computer anxiety (Fletcher & Deeds, 1992; Kotrlik & Smith, 1989; Price, 1986). Although teachers lack the computer knowledge and experience to use them effectively in the classroom, they report positive attitudes toward computers (Grasty, 1986).

Fletcher and Deeds (1992) found that the current level of computer skills explained 53 % of the variance in computer anxiety among secondary agriculture teachers. Kotrlik and Smith (1989) found five explanatory variables for the variance in computer anxiety among vocational teachers: computer skill level, principal's support, computer availability, perceived math ability, and formal computer training. Computer anxiety may be related to negative attitudes towards computers (Bellando & Winer, 1985; Hagey, 1988). Fletcher and Deeds (1992) found that agricultural education teachers' computer anxiety scores had low negative associations with computer training. Therefore, the most effective way of alleviating computer anxiety may be computer training which provides opportunities for teachers to learn about and work with computers (Lawton & Gerschner, 1982). Kotrlik and Smith (1989) found that teachers who had computers available at school were more likely to have higher levels of computer anxiety. Teachers with a home computer have more positive computer attitudes (Grogan, 1992; Burke; 1986). Grogan (1992), Carey (1985), and Burke (1986) investigated the significant interaction between the computer availability to the teacher at home and the teacher's attitude toward computers.

Computer attitudes are a reflection of an individual's personal perspective (Kinzie & Delcourt, 1991) and school characteristics (Mitchell, 1985). Research has reported that computer attitude of teachers is related to personal characteristics such as age (Martin, 1984; Hagey, 1988; Pope, 1992; Davis, 1989; Dolgos, 1991), years of teaching (Agnir, 1990; Potter, 1985; Martin, 1984; Davis, 1989; Tu, 1991; Nikolaus, 1988), educational level (Martin, 1984; Stenzel, 1982; Tu, 1991; Francis, 1990), subject matter (Newman, 1982; Kim, 1986), experience of teaching computers (Martin, 1984), familiarity with a keyboard (Koohang, 1987), math ability (Kotrlik & Smith, 1989), and external-oriented locus of control (Coovert & Goldstein, 1980; Kay, 1989).

Purpose and Objectives

The purpose of this study was to determine the relationship between the attitude of agricultural teachers toward computers in education and selected independent variables. Specifically, the objectives of the study were: (1) to determine the attitude of Korean agricultural teachers toward computers in education; (2) to determine the relationship between attitudes toward computers in education and computer training, perceived computer knowledge, perceived level of computer skills, computer anxiety, computer availability, school characteristics, and personal characteristics; and (3) to investigate the proportion of the variance in the attitudes of teachers toward computers in education that can be explained by the selected independent variables.

Methods

The design of the study was descriptive and correlational. The population for this study consisted of 1,510 agricultural teachers in 96 Korean secondary vocational agriculture high schools as of 1992 (Ministry of Education, Korea). All teachers in 33 vocational agriculture high schools were selected for the study by using random cluster sampling from the 96 schools stratified by school location and type of school. The researchers were not given access to the teacher's names and addresses.

A survey questionnaire about computers in education was developed by the researchers to secure the information needed for the study. The Korean version of the questionnaire included the following instruments adapted from the previous scales: a 5-point Likert-type attitude instrument (Yuen, 1985; Gressard & Loyd, 1985a; Kay, 1989); computer knowledge and computer skill scales (McCaslin & Torres, 1992); computer anxiety instrument (Oetting, 1983; Marcoulides & Wang, 1990); and locus of control scale (Rotter, 1966). A panel of experts was used to establish content and face validity. A pilot test was conducted with 26 vocational teachers in Korea, not included in the sample, to establish reliability. The alpha coefficients for the instruments included in the questionnaire were calculated to be .89 for computer attitude, .95 computer knowledge, .97 computer skills, .95 computer anxiety, .94 need for classroom computer use, .87 values of computer applications, and .79 locus of control.

A total of 564 questionnaire packages with cover letters and recommendation letters was mailed to each principal of 33 vocational agriculture schools. After the initial mailing and a reminder letter, a telephone follow-up was done to 3 nonrespondent schools. Two out of them indicated that they never received the questionnaire packages and the other school promised to respond but failed to return them immediately. Therefore, 420 questionnaires were returned from participants in the 30 schools; this represents a response rate of 74.5 %. A total of 357 usable responses was analyzed. Potential non-response error was addressed by comparing of respondents to nonrespondents based on the known characteristics (e.g., age, years of teaching, education level, etc.). There was no difference between the groups.

All data analysis was accomplished with the Macintosh SPSS/PC+ statistical package. The specific statistical techniques were correlations and multiple regression. The descriptors proposed by Davis (1971) were used to describe the correlations. An alpha level of .05 was established a priori for determining significant differences.

Results

Computer Attitude: Teachers of Korean secondary vocational agriculture showed a positive attitude toward computers with a mean computer attitude score of 106, a range of 67 to 142 and standard deviation of 14.18.

Computer Training: There was a moderate relationship between experience of computer training and attitudes of teachers toward computers ($r_{pb}=.36$). There was a moderate relationship between length of computer training and attitudes of teachers toward computers ($r=.31$). There was a low relationship between type of computer training (public inservice) and attitudes of teachers toward computers ($r_{pb}=.21$).

Competence: Moderate relationships were found between perceived level of computer knowledge ($r=.45$), perceived level of computer skills ($r=.46$) and attitude of teachers toward computers.

Anxiety: There was a low negative relationship between computer anxiety and attitudes of teachers toward computers ($r=-.28$). As teacher computer anxiety decreases, their computer attitude becomes positive.

Availability: There was a low relationship between attitudes of teachers toward computers and computer ownership ($r=.19$), level of accessibility of a teacher to school computers ($r=.27$), and number of school computer locations ($r=.12$). There was a moderate relationship between accessibility of a teacher to school computers and attitudes of teachers toward computers ($r_{pb}=.38$). All these associations were statistically significant at the $p<.05$ level.

School Characteristics: Low associations were found between computer attitudes of teachers and school location ($r=-.13$), number of agricultural classes ($r=-.13$), number of agricultural students ($r=-.13$), number of non-agricultural teachers ($r=-.11$), number of total teachers ($r=-.13$), accessibility of students to school computers ($r_{pb}=.24$), accessibility of staff to school computers ($r_{pb}=.19$), and business office as a computer location ($r_{pb}=.13$). All these associations were statistically significant at the $p<.05$ level. However, negligible associations were found between computer attitudes of teachers and type of school ($r_{pb}=-.05$), number of agricultural department ($r=.-07$), number of agricultural teachers ($r=-.10$), availability of computer experts ($r_{pb}=-.05$), ratio of computer users ($r=.08$), and computer lab ($r_{pb}=-.09$) of school characteristics. These associations were not statistically significant.

Personal Characteristics: Computer attitude of teachers had a moderate association with intention of commitment to use computers ($r=.49$), keyboard familiarity ($r=.41$), number of information sources on computers ($r=.38$), perceived value of computer applications for agricultural education ($r=.33$), and experience of teaching computers ($r_{pb}=.32$). Computer attitude had a low relationship with age ($r=-.20$), years of teaching ($r=-.17$), education level ($r_{pb}=.11$), areas of subject matter in agriculture ($r_{pb}=-.15$), job satisfaction ($r=.15$), perceived math ability ($r=.23$), perceived need for classroom computer use ($r=.27$), and external locus of control ($r=-.14$). All these moderate or low associations were statistically significant at the $p<.05$ level. However, computer attitude of teachers was not associated with gender ($r_{pb}=.09$), resident place ($r_{pb}=-.10$), or type of teaching certification in agriculture ($r_{pb}=-.09$).

Predictors of Computer Attitude: As shown in Table 1, 38% of the variance in computer attitude was explained by the linear combination of six variables in the equation. These variables were computer competence, length of training, intentions of commitment to school computers, value of computer applications for agricultural education, perceived needs for computer use in the classroom, and accessibility of students to school computers. The most influencing variable for computer attitudes in vocational agriculture teachers was intention of teachers about their commitment to use computers (R square change= 24.4%).

Table 1
Summary Date: Stepwise Multiple Regression Analysis of Computer Attitude on the Selected Traits of Vocational Agricultural Teachers (n=357)

Variable	R^2	R^2 Change	b	t	p
Intention	.244	.244	2.97	4.27	<.0001*
Value of Computer Applications	.316	.072	.84	4.70	<.0001*
Computer Competence	.346	.030	.07	2.50	.0131*
Accessibility of Students	.364	.018	3.48	2.58	.0105*
Needs for Computer Use	.374	.010	.19	2.18	.0300*
Length of Training	.383	.009	.01	2.15	.0322*
(Constant)			74.22	23.32	<.0001*

*: $p<.05$ Note: R=.62; Adjusted R Square=.383; For model: F=31.85, $p<.0001$

Conclusions and Recommendations

Most agricultural teachers in Korean vocational agriculture high schools have a positive attitude toward computers in education. Computer training, competence, anxiety, and availability were significantly related to the attitude of agricultural teachers toward computers in education.

Eight of 14 school characteristics were significantly associated with computer attitudes of agricultural teachers in vocational agriculture high schools: school location, number of agricultural classes, number of agricultural students, number of non-agricultural teachers, total teachers, accessibility of students to school computers, accessibility of staff to school computers, and the business office as one place of computers located in the school.

Twelve of 15 personal characteristics were significantly associated with attitudes of agricultural teachers toward computers: age, years of teaching experience, educational level, area of teaching subject matters, job satisfaction, teaching computers, math ability, intention to computer use, perceived value of computer applications for agricultural education, perceived need for classroom computer use, locus of control, number of information sources on computers, and familiarity with a keyboard.

The proportion of the variance in computer attitude explained by the linear combination of six variables in the equation was about 38%. The predicting variables were computer competence, length of training, intentions of commitment to school computers, value of computer applications for agricultural education, perceived needs for computer use in the classroom, and accessibility of students to school computers.

Most findings confirmed the conceptual model in the study. However, type of school, availability of computer experts in the school, and teacher reported ratio of computer users to teachers in vocational agriculture high schools did not confirm it. Of the "personal characteristics," gender, resident location, and areas of teaching specialty in agriculture also did not confirm the model. In addition, perceived level of computer knowledge and skills should be combined as "competence" rather than be separated because they are highly correlated with each other.

Based upon the results of the study, the following recommendations were made: (1) teacher educators should consider variables associated with attitude toward computers in education when designing computer courses or inservice for teachers; (2) educational administrators should support teachers' training in computer use or incorporating computer technology into vocational agriculture programs; (3) many efforts should also be made to reduce the differences in the attitudes among teachers in vocational agriculture high schools by providing inservice programs to develop and strengthen positive attitudes toward computers; and (4) inservice training should be planed to help the secondary agricultural teachers become comfortable with computers. In addition, some of the more important areas for further study are: (1) research of the same type as this study to identify variables influencing the attitude of administrators or other target population in vocational agriculture education; (2) research to test a proposed model about attitude toward computers in education in other target population; and (3) an experimental research to determine the relationship among computer training, competence (knowledge and skill), anxiety, and attitude toward computers.

References

Agnir, F. I. (1990). A study of attitudes about computers among faculty of three community colleges [Dissertation, U of MA, 1989]. Dissertation Abstracts International, A50/12, 3833.

Anderson, J. A. (1986). Microcomputer exposure related to elementary teacher concerns about the educational use of microcomputers. Doctoral dissertation, University of Minnesota.

Anderson, R. E., Hansen, T. P., Johnson, D. C., & Klassen, D. L. (1979). Minnesota computer literacy and awareness assessment. St. Paul: Minnesota Educational Computing Consortium.

Beck, J. J. (1979). An analysis of student attitude toward computer-assisted instruction in Nebraska public high schools. Doctoral dissertation, University of Nebraska.

Becker, W. J. & Shoup, W. D. (1985). The microcomputer as an instructional tool. The Journal of the American Association of Teacher Educators in Agriculture, 26(2), 65-72.

Bellando, J. & Winer, J. L. (1985). Computer anxiety relationship to math anxiety and Holland types. Austin, TX: Southwestern Psychological Association

Birkenholz, R. J. & Stewart, B. R. (1991). The use of instructional technologies in agricultural education. Journal of Agricultural Education, 32(2), 40-48.

Burke, M. W. (1986). The effects of inservice microcomputer training on teachers' attitudes towards educational computing. Doctoral dissertation, University of Alabama.

Camp, W. G. (1983). Microcomputers: A "byte" of the action. The Agricultural Education Magazine, 55(1), 13-14.

Camp, W. G. & Sutphin, H. D. (1991). Integrating microcomputers and related technologies in agricultural education. Journal of Agricultural Education, 32(1), 41-46.

Carey, D. M. (1985). An investigation of factors that affect elementary school teachers' use of computers. Doctoral dissertation, University of Oregon.

Clement, P. (1981). Affective considerations in computer based education. Educational Technology, 21, 28-32.

Coovert, M. D. & Goldstein, M. (1980). Locus of control as a predictor of users' attitude toward computers. Psychological Reports, 47, 1167-1173.

Davis, J. A. (1971). Elementary survey analysis. Englewood Cliffs, NJ: Prentice-Hall.

Davis, O. J. B. (1989). Early childhood teacher attitudes toward the instructional use of computers. [Dissertation, U of Houston, 1988]. Dissertation Abstracts International, A49/07, 1774.

DelFrate, J. (1987). An investigation of teachers' backgrounds, usage, and attitudes towards computers in education. Doctoral dissertation, The Ohio State University.

Dolgos, K. A. (1991). A study of the relationship between attitude, computer use, and teacher training at the secondary level (computer attitude) [Dissertation, Lehigh U, 1991]. Dissertation Abstracts International, A52/05, 1705.

Fletcher, W. E., & Deeds, J. P. (1992). Factors preventing microcomputer use among secondary agriculture education teachers in the United States. Proceedings of the 1992 National Agricultural Education Research Meeting.

Francis, S. (1990). The impact of educational level, gender, age, and computer experience on computer attitudes of adults enrolled in ABE and GED programs in the State of Arkansas [Dissertation, U of AR, 1988]. Dissertation Abstracts International, A50/07, 1897.

Grasty, C. A. (1986). A survey analysis of teacher attitudes, knowledge, and willingness to take computer training in public schools [Dissertation, Temple U, 1985]. Dissertation Abstracts International, A46/08, 2270.

Gressard, C. P. & Loyd, B. H. (1985a). Validation studies of a new computer attitudes scale. Paper presented at the 69th Annual Meeting of the American Educational Research Association (Chicago, IL, March 31-April 4).

Gressard, C. P. & Loyd, B. H. (1985b). Age and staff development experience with computers as factors affecting teacher attitudes toward computers. School Science and Mathematics, 85(3), 203-209.

Grogan, V. C. (1992). Computer attitudes of selected students and educators in relationship to computer access and experience and gender [Dissertation, U of NE, 1991]. Dissertation Abstracts International, A52/12, 4205.

Hagey, M. S. (1988). The computer: An assessment of teacher training, teacher attitudes, and computer inventory (Hardware and software) in grades K-8 in the metropolitan public schools of Nashville-Davidson county (Tennessee) [Dissertation, TN State U, 1985]. Dissertation Abstracts International, A48/11, 2850.

Hallworth, H. J. & Brebner, A. (1980). Computer assisted instruction in schools: Achievements, present developments, and projections for the future. (ERIC ED200185).

Hunter, W. & Deleeuw, G. (1988). Computers in teacher education. Association for Media and Technology, Halifax.

Johnson, N. D. (1987). Effects of inservice training on writing apprehension and computer anxiety in elementary school teachers. Dissertation Abstracts International, 48(4), 904.

Kay, R. H. (1989). A practical and theoretical approach to assessing computer attitudes: The computer attitude measure (CAM). Journal of Research on Computing in Education, 456-463.

Keenhan, C. E. M. (1983). An assessment of the attitudes of public school teachers toward microcomputers. Doctoral dissertation, Wayne State University.

Kim, Y. K. (1986). Computers in secondary schools: Relationships between teachers' attitudes and skills, and implications for a teacher training program in computer literacy. Doctoral dissertation, The University of Iowa.

Kinizie, M. B. & Delcourt, M. B. (1991). Computer technologies in teacher education: The measurement of attitudes and self-efficacy. American Educational Research Association.

Koohang, A. A. (1989). A study of the attitudes of pre-service teachers toward the use of computers. Educational Communication and Technology Journal, 35(3), 145-149.

Kotrlik, J. W. & Smith, M. N. (1989). Computer anxiety levels of vocational agriculture teachers. Journal of Agricultural Education, 30(2), 41-48.

Lawton, J. & Gerschner, V. T. (1982). A review of the literature on attitudes towards computers and computerized instruction. Journal of Research and Development in Education, 16(1), 50-55.

Madsen, J. M. & Sebastiani, L. A. (1987). The effect of computer literacy instruction on teachers' knowledge of and attitudes toward microcomputers. Journal of Computer Based Instruction, 14(2), 68-72.

Manarino-Lettett, P., & Cotton, B. (1985). Attitudes of teachers toward the use of computers in the schools. (ERIC ED280455).

Marcoulides, G. A. & Wang, X. (1990). A cross-cultural comparison of computer anxiety in college students. Journal of Educational Computing Research, 6(3), 251-263.

Martin, E. P. (1984). Teacher attitudes toward the use of computers in the educational process. Doctoral dissertation, Texas A & M University.

McCaslin, N. L., & Torres, R. M. (1992). Examining attitudinal factors related to agriculture teachers' perceived microcomputer competence. Proceedings of the Nineteenth Annual National Agricultural Education Research Meeting. St. Louis, Missouri.

Ministry of Education. (1992). Directory of the 1992 National Vocational Agriculture and Fisheries High Schools. Korea.

Mitchell, V. R. (1985). An assessment of urban elementary and secondary teachers' knowledge about, attitude towards, and willingness to use microcomputers. Doctoral dissertation, Memphis State University.

Na, S. I. (1993). Variables associated with attitudes of teachers toward computers in Korean vocational agriculture high schools. Doctoral dissertation, The Ohio State University.

Newman, C. A. (1982). Status and attitudes toward instructional computing in Arizona secondary schools with recommendations for a teacher education program in instructional computing [Dissertation, Northern AZ U, 1982]. Dissertation Abstracts International, A43/06, 1818.

Nikolaus, K. A. (1988). A study of the attitudes of Tennessee teachers toward computers in the classroom [Dissertation, TN State U, 1985]. Dissertation Abstracts International, A48/11, 2799.

Oetting, E. R. (1983). Manual: Oetting's computer anxiety scale (COMPAS). Ft. Collins, CO: Rocky Mountain Behavioral Science Institute, Inc.

Pope, S. M. (1992). An assessment of mathematics teacher knowledge and attitudes toward the use of computers in senior high instruction [Dissertation, Memorial U of Newfoundland, 1990]. Dissertation Abstracts International, 30/02, 211.

Potter, T. G. (1985). The effects of computer in-service training in logo on the attitudes of elementary school teachers toward computers in the classroom [Doctoral dissertation, The University of Arizona, 1984]. Dissertation Abstracts International, A45/08, 2390.

Price, W. L. (1986). The effects of in-service workshops on computer anxiety in elementary teachers (Dissertation, VIPs, 1985). Dissertation Abstracts International, A46/08, 2183.

Randhawa, B. S. & Hunt, D. (1984, Spring). Computers and computer literacy in contemporary psychological, socio-economic and education context. AEDS J., 1-11.

Rotter, J. (1966). Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs, 80 (1), 1-27.

Slowiczek, F. M. (1989). Determining variations in computer usage by secondary science teachers as influenced by state dissemination of software and instructional aids [Dissertation, Northern AZ U, 1988]. Dissertation Abstracts International, A49/10, 3002.

Stenzel, L. G. (1982). Teacher attitudes toward computer literacy [Dissertation, LA State U & A&M College, 1982]. Dissertation Abstracts International, A44/01, 145.

Stevens, D. J. (1980). How educators perceive computers in the classroom. AEDS Journal, 13(3), 221-232.

Steward, H. R. (1990). A study of the attitudes of Southeast Texas elementary principals and teachers toward the microcomputer. Doctoral dissertation, The Texas A&M University.

Tu, R. J. (1991). An analysis of perceived literacies and attitudes concerning microcomputer usage by technical-education instructors at two-year colleges and technical institutes in Tennessee (Computer literacy) [Dissertation, U of TN, 1991]. Dissertation Abstracts International, A53/03, 778.

Woodrow, J. E. J. (1987). Educators' attitudes and predispositions towards computers. Journal of Computers in Mathematics and Science Teaching, 27-37.

Woodrow, J. E. J. (1990). Locus of control and student teacher computer attitudes. Computers and Education, 14(5), 421-32.

Woodrow, J. E. J. (1991). Teachers' perceptions of computer needs. Journal of Research on Computing in Education, 23(4), 475-493.

Yuen, C. Y. (1985). Attitudes of trade and industrial teachers toward the use of microcomputers. The Journal of Vocational Education Research, 10(2), 51-64.

AN EVALUATION OF THE LEADERSHIP INVOLVEMENT OF ALUMNI FROM THE NEBRASKA LEADERSHIP EDUCATION/ACTION DEVELOPMENT PROGRAM--A TEN YEAR FOLLOW STUDY

Larry L. Andelt, Graduate Assistant
Roy D. Dillon, Professor
Department of Agricultural Leadership, Education and
Communication University of Nebraska-Lincoln

Introduction

The Nebraska Leadership Education/Action Development Program (LEAD) was initiated in 1981 through a grant from the W. K. Kellogg Foundation and the Institute of Agriculture and Natural Resources at the University of Nebraska-Lincoln. The program objectives were to: (1) develop increased knowledge and understanding of economic and social changes affecting agriculture and rural areas, (2) increase participants' knowledge of organizational decision-making processes and the role of political-legal institutions, (3) develop a greater sensitivity to the needs and aspirations of other groups in society, and (4) encourage and facilitate practical application of leadership skills while representing agriculture on local, state and national issues.

Thirty Nebraska agriculturalists, in the 25 to 45 year age range, are selected as "Fellows" in the LEAD program each year. They complete a two-year intensive continuing education program, involving thirteen resident seminars each year, a study/travel seminar in the United States to study national issues the first year, and a three-week study/travel seminar outside the United States to study international issues the second year.

In 1986, SRI Research, Inc. conducted a study to evaluate the extent to which the program's purposes and objectives were being achieved. LEAD program alumni were compared with persons who had applied but were not selected for the LEAD program. The SRI study concluded that LEAD alumni had a broader view and a deeper perspective of the factors affecting agricultural economics and policy than did those who had not had the LEAD experience. Alumni were more sensitive to national and international issues, and were more active as leaders in agricultural related organizations.

Twenty-five states in the U.S. have established leadership development programs designed to improve leadership ability of present and future agricultural leaders. One evaluation of the early programs in Michigan, California, Pennsylvania, and Montana conducted in 1976 by Howell et al. (1976) found that statewide programs at least two years in length: (1) increased the involvement of many program graduates in related public affairs activities, especially those activities that were regional in scope, (2) increased the involvement of graduates in economics organizations, and social and fraternal groups, and (3) increased the leadership and problem solving of graduates. Olson (1992) found through a case study of 355 graduates of the Washington Agriculture and Forestry Education Foundation's leadership development program, that participants had moderate increases in forty skills contributing to successful leadership. Respondents in a recent evaluation of the California Agricultural Leadership Program (Whent et al., 1990) reported that participation in the program increased their community involvement, helped them attain state association positions, and helped advance their careers.

This study was designed to research the leadership involvement of LEAD Alumni, by examining the experience of LEAD Fellows (now LEAD Alumni) ten years after applying for the program, and comparing their experience with persons who applied but were not selected for the LEAD program during the same time period (Control Group Applicants).

Purposes and Objectives

The purposes of the study were to determine if there were significant differences between the LEAD Alumni Group and the Control Applicant Group in: (1) the number of times their occupation changed since the time of application for the program, (2) the number of organizations to which they belonged at the time of application for the program, (3) the level of membership in organizations to which they belonged at the time of the study, (4) the number of organizational officer positions held at the time of application for the program, (5) the number of organizations to which they belonged at the time of the study, (6) the number of organizational officer positions held at the time of the study, (7) the level of organizational officer positions held at the time of application for the program, (8) the level of organizational officer positions held at the time of the study, (9) the mean hours per month devoted to organizations to which they belonged at the time of the study, (10) their perception of the degree of change in their involvement in leadership activities and responsibilities at the time of the study compared to the time of application for the program, (11) the number of organizations to which respondents belonged at the time of application for the program, and the time of the study, by Group, and (12) the number of organizational officer positions held at the time of application for the program, and the time of the study, by Group.

Procedures

Random samples of 15 persons each were selected from the two populations of 30 graduates of the LEAD programs beginning in 1982 and 1983. This group of 30 persons was identified as the LEAD Alumni group. Random samples of 15 persons each were also selected from the population of 90 persons who applied for the LEAD program beginning in 1982 but were not selected, and from the 122 persons who applied for the LEAD program beginning in 1983 but were not selected. This group of 30 persons was identified as the Control Applicant Group.

An instrument designed to obtain data upon which to measure the objectives of the study was developed. The instrument was validated by a jury of four experts on the staff of The Center For Leadership Development at The University of Nebraska. Revisions were made following this jury review. The instrument was then pilot tested via telephone interview with ten persons in the Control Applicant Group who were not selected in the sample. Revisions were made in the instrument following this procedure.

Telephone interviews were conducted with the 30 persons in the LEAD Alumni Group and the 30 persons in the Control Applicant Group in November and December 1992.

Analysis of Data

The data were analyzed using the SPSS Package. The one-way anova between groups was the statistical test used.

Results

1. At the time of the study, 22 or 73.3% of the Lead Alumni Group and 18 or 60% of the Control Applicant Group were in production agriculture.

2. The Lead Alumni Group and the Control Applicant Group were equally involved in the number of organizational memberships at the time of application for the program.

3. Lead Alumni were involved in 1.43 state organizations per person, and the Control Group Applicants were involved in .76 state organizations per person.

4. The Lead Alumni had a gain of 1.70 organizations per person, and the Control Applicant Group had a gain of .77 organizations per person from the time of application for the program to the time of the study.

5. The gain of 1.70 organizational memberships per person for the Lead Alumni at the time of the study, was a highly significant increase over the mean number of memberships held at the time of application for the program.

6. The gain of .77 organizational memberships per person for the Control Group Applicants at the time of the study, was a significant increase over the mean number of memberships they held at the time of application for the program.

7. LEAD Alumni held a significantly greater number of organizational officer positions per person (1.63) at the time of the study, compared to the Control Group Applicants (1.23). The LEAD Alumni held 51 officer positions at the time of the study; 12 were Presidents, 34 were "other officers," and 5 were Committee Chairs. Control Group Applicants held 38 officer positions at the time of the study; 10 were Presidents, 24 were "other officers," and 4 were Committee Chairs.

8. At the time of the study, LEAD Alumni reported a mean of 20.4 hours per month devoted to organizations to which they belonged, while Control Group Applicants reported a mean of 12.8 hours per month to organizations to which they belonged.

Conclusions

Results showed that persons who applied but were not selected for the LEAD program (Control Group Applicants), were different from LEAD Alumni in that Control Group Applicants had a higher number of organizations in which they participated in the organizational office of Committee Chair at the time of application for the program.

Finally, results of the study showed that LEAD Alumni were different from persons who applied but were selected for the program, in that LEAD Alumni:

1. Held membership in more state organizations at the time of the study.

2. Held a greater number of officer positions in organizations in which they were member at the time of the study.

3. Held a greater number of organizational officer positions as President at the time of the study.

4. Devoted more hours per month to organizations to which they belonged.

5. Had a greater increase in officer positions per person from the time of application for the program to the time of the study.

The authors believe the LEAD program has reached the objectives this study investigated, through participants' becoming more involved in organizations and in leadership roles, particularly at the state level, and having a greater degree of influence in leadership situations.

Recommendation

The primary recommendation is that research be conducted which compares the leadership involvement of LEAD Alumni with other nominated peers at the local and statewide levels, in an effort to develop a broader base from which to generalize results.

References

Howell, R. E., Weir, I. L., & Cook, A. K. (1976). Public Affairs Leadership Development: An Impact Assessment of Programs Conducted in California, Michigan, Montana, and Pennsylvania--Executive Summary. Pullman: Washington State University, Department of Rural Sociology.

Marcou, R. (1990). Leadership Training: An Impact Assessment of the Ontario Advanced Agricultural Leadership Program. Unpublished Master's Thesis. Ontario: The University of Guelph.

Olson, L. (1992). Washington Agriculture and Forestry Education Foundation's Impact on Transformational and Transactional Leadership Styles of Participants. Unpublished Doctoral Dissertation. East Lansing: Michigan State University.

SRI Research Center, Inc. (1986). LEAD Program Evaluation, Executive Summary. Lincoln, NE: SRI-Gallup Research, Inc.

Whent, L., Leising, J., & Tibbitts, N. (1990). Evaluation of the California Agricultural Leadership Program. Staff Study. Davis: University of California, Agricultural Education Unit, ABS Department.

PERCEPTIONS OF AGRICULTURAL EXTENSION AGENTS REGARDING AGRICULTURAL BIOTECHNOLOGY TRAINING AND INFORMATION NEEDS

Robert A. Martin
Professor
Iowa State University

E. Craig Williams
Extension Educator
Iowa State University

> To say this area of research (biotechnology) is dynamic is an understatement. In fact, research in the biotechnologies is so rapid that articles written in scientific journals are often eclipsed by new developments before the articles are off the press. Biotechnology promises to yield an infinite number of improvements in just about every enterprise from health care to waste management. Most predictions point to agriculture as the industry that will reap the greatest benefits (Kinney, 1985; p. 1).

Agriculture continues to feel the impact of new technologies and innovations. Biotechnology is one of these new areas of technology and innovation. Actually, biotechnology is not new but the approach to biotechnology may be new. Biotechnology is the application of scientific principles to the processing of materials by biological agents to provide goods and services. As a biologically-based set of industries, agriculture is in the ideal position to reap the major benefits associated with the biotechnology revolution.

American agriculture will need to continue to improve its competitive edge by increasing efficiency in food and fiber production (Clarke, 1986). Clarke further suggested that agriculture needs a new infusion of science and technology and new capabilities that will restore and enhance competitiveness of U.S. agriculture in the world marketplace" (p. 37). American farmers must continue to look for ways to produce agricultural products as efficiently as possible, while maintaining quality of those products (Committee on a National Strategy for Biotechnology in Agriculture, 1982).

In the past, agriculture has been an energy and labor intensive industry. Biotechnology offers the opportunity to reduce both these costs and future operations. Inherent resistance to pests and disease can reduce the use of chemical pesticides, reducing the cost of production and the potentially harmful environmental effects of such practices. The possible uses of biotechnology for agriculture are limited only by imagination and initiative (Clarke, 1986).

It is important for educators to understand the adoption process, and be able to identify factors that influence this process. Educators can better target educational program efforts to aid in technology transfer if it is known which types of farm operators are more likely to be seeking information on new technologies (Kamga & Cheek, 1986).

> The Cooperative Extension Service (CES) should focus some of its efforts on the transfer of biotechnology research that will prove adaptable and profitable to the agricultural community. It should train many of its specialists in biotechnology and increase its interaction with the private sector to keep abreast of the new biotechnology valuable to the agricultural community. Furthermore, CES should work to anticipate and alleviate social economic impacts that result from the application of new biotechnologies. CES should play a key role in educating the public about biotechnology.

Biotechnology has the potential to alter and change several production practices and systems. It is important that educators are aware of the attitudes and perceptions that farm operators have towards the new biotechnologies, and the interest level in obtaining more information about these innovations, as well as being informed themselves regarding innovations resulting from biotechnology.

Purpose of the Study

This study was an attempt to identify perceptions held by Agricultural Extension Agents regarding various aspects of agricultural biotechnology. The purpose of this study was to identify topical areas in agricultural biotechnologies in which there was a need for training. Additionally, the study sought to measure the degree to which informational materials were needed by Agricultural Extension Agents. The results of this investigation provided useful information to Extension program leaders and staff as to inservice training needs of field staff, as well as provide an indication as to the type of informational material to be developed.

Objectives

The specific objectives of this study were as follows:

1. To identify the level of importance of agricultural biotechnology as perceived by Agricultural Extension Agents.

2. To determine the extent of training needed as perceived by Agricultural Extension Agents regarding various topical areas in biotechnology.

3. To determine the degree of importance relating to informational material needed by Agricultural Extension Agents regarding various topical areas in biotechnology.

4. To identify perceptions held by Agricultural Extension Agents in regard to biotechnology's potential.

Methods/Procedures

The research approach used in this study was descriptive, utilizing the survey method. A self-administered questionnaire was developed for data collection due to the advantages of time and expense (Dillman, 1978). It was determined that this survey instrument should be send to all Extension field staff in Iowa with agriculture responsibilities.

The accessible population consisted of the 120 Iowa State University Extension field staff with agricultural responsibilities in Iowa. The instrument used in this study was designed to identify perceptions of extension professionals in agriculture. The instrument was developed with information gathered from the literature, input from a panel of extension professionals and biotechnology educators. Section 1 focused on questions related to the level of agreement regarding the need for training and informational materials. Section 2 asked respondents to indicate their level of agreement with concept statements regarding bioethics, biotechnology's impact on agriculture and Extension's role. Section 3 requested demographic data. Likert-type scales (5 = Strongly Agree to 1 = Strongly Disagree) were used in Sections 1 and 2. Questionnaires were sent to 31 ISU Extension Area Specialists with agricultural responsibilities and to 89 County Extension Agriculturists. The initial mailing resulted in the completion and return of 75 questionnaires. A follow-up message on "Exnet," ISU's communication system to outlying centers, resulted in the return of 29 more questionnaires for a total of 104, in which 95 were in a usable form for processing. The Cronbach alpha procedure to test reliability for the first two sections of the instrument determined a reliability coefficient of .9022. Means, standard deviations and frequencies were used in analyzing the data from the study.

Findings

Most of the respondents were male (94.7%), with a majority (76.8%) reporting ages between 36 and 55 years old. The respondents averaged 14.7 years of experience in Cooperative Extension.

The majority (82.1%) hold an advanced degree, with 74.7 percent having a Master's Degree and 7 percent a Doctoral Degree. County Extension Agriculturists made up a majority of the group (76.8%), with the balance Area Extension Agriculture Specialists.

Perceptions Regarding the Need for Training

The respondents were asked to indicate their level of agreement with the need for training regarding the topical items associated with biotechnology. The items were scored on a five-point Likert-type scale where 1 indicated "strongly disagree," 2 indicated "disagree," 3 indicated "neutral," 4 indicated "agree," and 5 indicated "strongly agree." The means and standard deviations of the level of agreement regarding training needs in the topical items as perceived by the respondents are listed in descending order in Table 1.

Table 1
Means and Standard Deviations Regarding the Perceived Need for Training in Each of the Topic Areas in Biotechnology by Iowa Agricultural Extension Agents (N=95)

Rank	Item	Mean[a]	S.D.
1	Disease and Pest Resistant Crop Varieties	4.22	0.90
2	Herbicide Resistant Crop Varieties	4.16	0.93
3	Economic Implications of Biotechnology	4.11	0.82
4	Disease Resistance in Livestock	4.05	0.90
5	New Crop Varieties	4.03	0.99
6	New Uses for Crop and Livestock Products	4.02	0.92
7	Biological Control of Pests	4.02	0.94
8	Growth Regulators	3.97	0.86
9	Using Porcine Somatotropin (PST) in Pork Production	3.96	1.04
10	Environmental Impacts of Biotechnology	3.95	0.87
11	New Uses for Agricultural By-Products	3.92	0.84
12	Corn Varieties That Fix Own Nitrogen	3.90	1.00
13	Risk Assessment of Biotechnology	3.90	0.86
14	Social Implications of Biotechnology	3.81	0.96
15	Diagnostic Kits Using Biotechnology	3.73	0.84
16	Bioethics	3.72	0.93
17	Policy Implications of Biotechnology	3.72	0.92
18	Using Bovine Somatotropin (BST) in Dairy	3.70	1.17
19	Genetic Engineering	3.46	0.94
20	Cloning	3.26	0.97
21	Gene Insertion	3.24	0.97
22	Recombinant DNA	3.22	0.98
23	Tissue Culture	3.21	1.03

[a]Scale: 1=strongly disagree; 2=disagree; 3=neutral; 4=agree; 5=strongly agree.

Overall, the topic areas displayed in Table 1 received a mean score rating from 3.00 (neutral) to 4.00 (agree), which indicate the perceived level of agreement of Iowa Agricultural Extension Agents regarding training needs in biotechnology. The lowest mean score was 3.21 (neutral), and the highest mean score was 4.22 (agree), indicating either a neutral stance regarding training needs, to agreement that training was needed in certain topical areas. The respondents did not score any item below a 3.00 (neutral); thus, there was no disagreement with the need for training in each of the topics associated with biotechnology used in this questionnaire.

Perceptions Regarding the Need for Informational Materials

The respondents were asked to indicate their level of agreement with the need for informational materials on the topical items associated with biotechnology. The items were rated on a five-point Likert-type scale where 1 indicated "strongly disagree"; 2 indicated "disagree"; 3 indicated "neutral"; 4 indicated "agree"; and 5 indicated "strongly agree". The means and standard deviations of the level of agreement regarding informational material needs on the topical items as perceived by the respondents are listed in descending order in Table 2.

Table 2
Means and Standard Deviations Ranked in Descending Order Regarding the Perceived Need for Informational Materials in Rach of the Topical Items in Biotechnology by the Iowa Agricultural Extension Agents. (N=95)

Rank	Item	Mean[a]	S.D.
1	Disease and Pest Resistant Crop Varieties	4.33	0.82
2	Biological Control of Pests	4.31	0.86
3	Herbicide Resistant Crop Varieties	4.30	0.81
4	New Crop Varieties	4.27	0.91
5	New Uses for Crop and Livestock Products	4.23	0.84
6	Economic Implications of Biotechnology	4.17	0.82
7	Disease Resistance in Livestock	4.16	0.79
8	Using Porcine Somatotropin (PST) in Pork Production	4.16	0.93
9	Environmental Impacts of Biotechnology	4.11	0.86
10	Growth Regulators	4.10	0.85
11	New Uses for Agricultural By-Products	4.08	0.90
12	Risk Assessment of Biotechnology	4.04	0.82
13	Corn Varieties That Fix Own Nitrogen	4.04	0.97
14	Using Bovine Somatotropin (BST) in Dairy	3.98	0.99
15	Diagnostic Kits Using Biotechnology	3.88	0.92
16	Social Implications of Biotechnology	3.87	0.90
17	Bioethics	3.84	0.94
18	Policy Implications of Biotechnology	3.84	0.96
19	Genetic Engineering	3.63	1.02
20	Cloning	3.45	0.94
21	Recombinant DNA	3.34	0.98
22	Tissue Culture	3.32	1.00
23	Gene Insertion	3.29	1.03

[a] Scale: 1=strongly disagree; 2=disagree; 3=neutral; 4=agree; 5=strongly agree.

Overall, the topical items displayed in Table 2 received a mean score rating from 3.00 (neutral) to 4.00 (agree), which were indicative of the perceived level of agreement of Iowa Agricultural Extension Agents regarding informational needs of these topics in biotechnology. The lowest mean score was 3.29 (neutral) and a high mean score of 4.33 (agree), indicating either a neutral stance regarding informational needs to agreement that informational material is needed in these topical areas.

The respondents did not score any item below a 3.00 (neutral); thus, there was no disagreement with the need for informational material in each of the topics associated with biotechnology used in this questionnaire.

Perceptions Regarding Biotechnology Statements

Respondents were asked to indicate their level of agreement with statements pertaining to biotechnology's potential impact on agriculture. The means and standard deviations of the level of agreement with statements pertaining to biotechnology's potential impact on agriculture are displayed in Table 3. Of these 12 statements, only one had a mean score higher than 4.00 (somewhat agree), and four statements had mean values between 3.50 and 3.99, indicating a level of agreement from a neutral stance to somewhat agree. The statement "biotechnology will produce plant varieties and livestock species that are more resistant to disease and pests" rated the highest mean (x=3.66). The third highest mean rating was the statement "biotechnology will lead farmers to become more dependent upon large corporations for many of their inputs such as seeds, growth hormones, and feed additives" (x=3.65). The fourth highest mean rating was the statement "biotechnology will assist the development of sustainable agriculture" (x=3.60). The fifth highest mean rating was the statement "biotechnology will produce biological controls for pests that are reliable and economical" (x=3.56).

Three statements were rated between 2.50 and 3.49 (neutral). The lower mean scores indicate statements where respondents somewhat disagreed. Respondents disagreed with the statement "Advances in biotechnology will probably benefit persons with middle-sized and small farm operations more than persons with large farms", which had the lowest mean score (x=1.98). The next lowest mean score was the statement "advances in biotechnology will probably benefit diversified farms more than specialized farm operations" (x-2.04). The third lowest mean score was the statement "biotechnology will cause farmers to become more dependent upon agricultural chemicals" (x=2.28). The fourth lowest mean score was the statement "biotechnology will have an adverse effect on the environment" (x=2.30).

Conclusions

1. The findings provided evidence that the respondents felt biotechnology to be an important topic in Extension.

2. The findings verify there is a need for training and informational material pertaining to biotechnology for Iowa Agricultural Extension Agents.

3. The topic areas received similar ratings for both training and informational needs.

4. The respondents as a group viewed biotechnology as an important topic and that ISU Extension should be involved with the educational aspect of biotechnology.

Table 3
Means and Standard Deviations of Level of Agreement Regarding Statements Pertaining to Biotechnology's Potential Impact on Agriculture as Perceived by Iowa Agricultural Extension Agents (N=95)

Topics	Mean[a]	S.D.
Biotechnology will produce plant varieties and livestock species that are more resistant to disease and pests.	4.06	0.86
Economic gains will be realized from the timely adoption of growth promotents (PST; BST).	3.66	0.88
Biotechnology will lead farmers to become more dependent upon large corporations for many of their inputs, such as seeds, growth hormones, and feeds additives.	3.65	0.93
Biotechnology will assist the development of sustainable agriculture.	3.60	0.89
Biotechnology will produce biological controls for pests that are reliable and economical.	3.55	0.79
Biotechnology will cause overproduction and surpluses of agricultural commodities.	3.14	0.87
Biotechnology will help solve the problem of farm surpluses by finding new uses for crops, livestock, and their by-products.	3.04	0.95
Biotechnology will improve the economic stability of farm families and bring improved levels of living.	2.89	0.81
Biotechnology will have an adverse effect on the environment.	2.29	0.92
Biotechnology will cause farmers to become more dependent upon agricultural chemicals.	2.28	0.89
Advances in biotechnology will probably benefit diversified farms more than specialized farm operations.	2.04	0.91
Advances in biotechnology will probably benefit persons with middle-sized and small farm operations more than persons with large farms.	1.98	0.85

[a]Scale: 1=strongly disagree; 2=somewhat disagree; 3=neutral; 4=somewhat agree; 5=strongly agree.

Recommendations from the Study

Based upon the findings of this study, the following recommendations were made:

1. Inservice training should be planned for ISU Extension field staff targeting topical areas in biotechnology rated highly in this study.

2. Informational materials should be developed by ISU to inform and educate staff about biotechnology, targeting those areas identified in this study as important to the respondents.

3. Publications and other informational materials should be developed and distributed by ISU Extension to help educate the agricultural and public sectors about biotechnology.

4. The results of this study should be shared with ISU Extension's program leader for Agriculture and Natural Resources and others responsible for planning inservice training for extension personnel.

5. Educational programs focusing on innovations produced from biotechnology that relate to crop and livestock production be planned and delivered to Iowa Agricultural Extension Agents and other agricultural educators.

6. Biotechnology topics inserted into ISU Extension's program plan of work materials that are used by county and area program planning committees.

Educational Implications

The findings of this study clearly indicate that biotechnology is an important topic according to the Iowa Agricultural Extension Agents participating in the study. The findings also implied a perceived need for training and informational materials for most of the selected topics pertaining to biotechnology used in the questionnaire. Furthermore, the mean scores for the topic areas in the training and informational sections could be used to target areas in biotechnology for the development of in-service training programs for Agricultural Extension Agents and the development of informational materials for the respondents and others interested in biotechnology. The respondents implied that training and informational materials were important for educating not only agricultural clients, but also the general public. A comment made by a respondent perhaps sums up this point: "All the good things in the world will fail if public perception is negative. We must instill confidence that the technology is safe."

References

Clarke, N. P. (1986). Implications of the Biotechnology Revolution for Agriculture. Research for Tomorrow. 1986 Yearbook of Agriculture. Washington, DC: USDA.

Committee on a National Strategy for biotechnology in Agriculture. (1987). Board on Agriculture, Washington, DC: National Research Council.

Kamga, A. & Cheek, J. (1986). Factors related to adoption and non-adoption of technical and organizational recommendations by farmers involved with the societe de development du cacoa (SO. DE. CAO) in Cameroon (Research/Technical 1431). Gainesville: University of Florida, Department of Agricultural and Extension Education.

Kinney, T. B. (1985). Introduction: Biotechnology in Perspective. In Beltsville Symposia in Agricultural Research, Biotechnology for Solving Agricultural Problems (pp. 1-6). Agricultural Research Service, USDA, Washington, DC: Martinus Nijhoff Publishers.

EFFECTS OF EQUIPMENT MAINTENANCE AND OPERATION VARIABLES ON ENERGY USE IN THE AGRICULTURAL MECHANICS LABORATORY

Stanley R. Burke, Associate Professor
Agricultural Education Program
Virginia Tech

Introduction

Over 50% of the energy used in this country is wasted and could be cut by one third to one half without a decline in our quality of life, Miller (1975). Neill (1977) noted that in the United States "it is known that 25 to 50% of school energy is wasted." Contributing to this wasteful use of energy are school personnel who are improperly trained in the operation and maintenance of school plant equipment. Keeping equipment clean and adjusted are steps that could help schools cut energy consumption, Neill (1977).

President Carter (1977) advocated an energy conservation plan for the nation. In a fireside chat with the nation he said "We must face the fact that the energy shortage is permanent. There is no way we can solve it quickly." Carter went on to stress the need for a national energy policy and advocated energy conservation as one of the key ways of addressing the nation's energy problem. According to Macrakis (1974) if the current trend in the demand for electricity is projected to the year 2000, the quantity of electricity demanded will increase at least six times over the 1970 levels. Boggs (1985), Deputy Secretary of Energy, in testifying before a senate hearing warned that ..."without new generating capacity the lights will start to go out sometime in the 1990's and will continue to do so increasingly as the decade progresses." Boggs, in a Department of Energy report, emphasized that the nation will need 438 gigawatts (438,000 megawatts) in additional generating capacity by the year 2000. This same report highlighted conservation practices and more efficient energy use as alternative methods to slow the demand growth for electricity.

Miller (1975) described Four Energy Crisis facing the nation, he indicated that at a survival level a person needs about 2000 kilocalories of energy per day to live. He noted that the average American consumes more than 230,000 kilocalories of energy per day, a 115 fold increase over survival level. World energy consumption has increased over 600% between 1900 and 1965. It is projected to increase another 450% between 1965 and 2000. The failure to develop and coordinate a national energy policy was listed by Miller as one of our Four Energy Crisis. He describe conservation as an action which can help cope with our energy shortage problem.

Rising energy costs is a major concern of public school officials. Neill (1975) found in a study among members of the American Association of School Administrators that energy cost was ranked as their top concern. Several studies have established that equipment maintenance in school laboratories is a problem of great concern; Burke (1991), O'Neal (1986), Plakke (1985), and Wall and Jessee (1971). The national concerns for energy conservation and controlling school energy costs makes proper equipment maintenance and operation important measures which should be practiced in our schools. Hence, this study was designed to investigate the relationships between maintenance and energy use by equipment in agricultural mechanics laboratories.

Purpose and Objectives

The purpose of this investigation was to determine the effects of maintenance and operation variables on the electrical energy consumed by power planers in agricultural mechanics laboratories. Study objectives were to determine the effects of:

1. Blade sharpness and machine adjustment on electrical energy consumption by power planers.
2. Wood hardness on electrical energy consumption by power planers.
3. Depth of cut on electrical energy consumption by power planers.
4. Rate of feed on electrical energy consumption by power planers.

Procedures

This investigation was conducted as an experimental study using a factorial design. Pretest-posttest measures were taken on each planer. Measures were repeated on five identical machines. Equipment used in this study was Powermatic model 180 planers located in agricultural mechanics programs in Virginia.

The maintenance variables in this study were blade sharpness and machine adjustment. Pretest measures of electrical energy consumption were made with planer blades in a dull condition. To achieve a uniform standard of dullness on each machine, blade edges were filed to remove sharp cutting surfaces. Posttest measures were taken after sharp blades were installed and proper adjustments made to planers.

Electrical energy measures were made using the meter disk method on a kilowatt hour meter. Planers used in the study were powered by three phase electrical motors. "Y" three phase electrical power was available at each study site, thus a "Y" three phase kilowatt hour meter was used to measure the electrical energy consumed by each planer in the study.

The operation variables in this study were wood hardness, depth of cut, and rate of feed. The variable speed adjusting wheel was used to set machines for fast, medium, and slow feed rates. The table elevating handwheel was used to adjust cut depths at 1/16 and 1/8 inch. The lumber used in this study was oak, black walnut, and pine. These species represent very hard, medium hard, and soft hardness textures and are commonly used in agricultural mechanics programs in Virginia. All lumber samples were precut and glued to achieve uniform lengths (8 ft.) and widths (8 in.). Lumber samples were pre-surfaced to assure that full blade contact was made on each pass through the planer.

Energy measurements were taken on each lumber hardness sample with dull and sharp blades; taking 1/16th and 1/8th inch depths of cut; and at fast, medium, and slow feed rates. Treatment consisted of installing sharp knives and fully adjusting planers to manufacturer specifications. Energy measurements were repeated after treatments were applied.

Inferential and descriptive statistics were used to analyze the data. Statistical analysis of group means was made using the analysis of variance (ANOVA) procedure. Group means were also used in making calculated energy saving projections. An alpha level of .01 was used to ascertain statistical significance.

Results

Using the ANOVA statistical test, data analysis revealed that energy consumption by power planers, as measured in watt hours, is significantly influenced by maintenance and operation variables, refer to Table 1.

Table 1
Effects of Maintenance and Operation Variables on Watt Hours of Electricity Used by Planers as Determined by Analysis of Variance

Source	Sum of DF	Mean Squares	F Squares	Value	PR>F
Between Groups	38	375951904	9893471	12.17	.0001*
Within Groups	105	85365120	813001		
Total	143	461317024			

*Note. Significant

The effects of the maintenance and operation variables were partitioned using the ANOVA procedure. The analysis showed that wood hardness, rate of feed, depth of cut, and blade sharpness and machine adjustment have significant effects on the watt hours of electricity required to operate a power planer, see Table 2.

Table 2
The Partitioned Effects of Maintenance and Operation Variables on Watt Hour Consumption as Determined by Analysis of Variance

Source	Sum of DF	Sum of Squares	F Squares	PR>F
Hardness	2	38537875	23.70	.0001*
Rate	2	8873101	5.46	.0056*
Hardness x Rate	4	1867967	.57	.6818
Depth	1	26797494	32.96	.0001*
Hardness x Depth	2	36964	.02	.9775
Rate x Depth	2	493794	.30	.7387
Hardness x Rate x Depth	4	274940	.08	.9870
Blade	1	212356413	216.20	.0001*
Hardness x Blade	2	7040257	4.33	.0156
Rate x Blade	2	736434	.45	.6370
Hardness x Rate x Blade	4	1143932	.35	.8423
Depth x Blade	1	21723782	.67	.1051
Hardness x Depth x Blade	2	440137	.27	.7634
Rate x Depth x Blade	2	256253	.16	.8544
Hardnessx Rate x Depth x Blade	4	136015	.04	.9966

*Note. Significant

Analysis of group means showed that electricity used by planers, when they are dull and unadjusted, was 5258 watt hours compared to 2829 watt hours when the planer blades are sharp and the machine is properly adjusted. Dull unadjusted planers required 85% more electrical energy to perform the same work as sharp well adjusted planers (see Table 3).

Table 3
The Influence of Blade Sharpness and Adjustment on Watt Hours of Electricity Consumed by Power Planers

Blade Sharpness and Adjustment	N	Watt Hours N	Mean Difference Watt Hrs.	%
Dull and Unadjusted	72	5278	2449	85.6
Sharp and Adjusted	72	2829		

The data indicate that when planing at 1/8th inch depth of cut the planer consumed 4475 watt hours of electricity verses 3612 watt hours when planing at 1/16th inch depth of cut. A saving of 863 watt hours of energy was realized when planing was performed at the smaller cut depth. Watt hour values were measured across all lumber species, feed rates, and maintenance conditions, note Table 4.

Table 4
The Effects of Depth of Cut on Watt Hours of Electricity Used by Power Planers

Depth of Cut	N	Watt Hours N	Mean Difference Watt Hrs.	%
1/16 inch	72	3612	863	24
1/8 inch	72	4475		

Analysis of the data revealed that hard lumber (oak) required 4606 watt hours for planing compared to 4168 watt hours for medium hard (walnut) and 3357 watt hours for soft lumber (pine). Energy measurements were made across all feed rates, depths of cut, and maintenance conditions, see Table 5.

Analysis of feed rate results indicate that fast feeds require 5% more energy than medium feed rates and 16% more energy than the slow feed rates. The fast feed rate consumed 4305 watt hours of energy while the medium feed rate used 4116 watt hours. The slow feed rate used 3710 watt hours of electricity. These measures were taken across all depths of cut, wood species, and maintenance conditions.

Energy savings were projected over 100 hours of planer use to show long term effects. Analysis showed that properly adjusted machines, operating with sharp blades, used 282.9 kilowatt hours (KWHR) of electricity compared to 525.5 KWHR for unadjusted planers with dull blades. Properly adjusted planers operating with sharp blades resulted in a savings of 242.9 KWHR of electrical power or a 46.2% reduction in energy use from the dull blades unadjusted position, refer to Table 6.

Table 5
The Effects of Wood Hardness on Power Planer Electrical Power Consumption

Wood Hardness	N	Watt Hours N	Mean Difference Watt Hrs.	%
Hard (Oak)	48	4606		
		}	438	10.5
Medium Hard (Walnut)	48	4168		
		}	811	24.2
Soft (Pine)	48	3357		
		}	1249	37.2
Hard (Oak)	48	4606		

Conclusions

The following conclusions were drawn based on the study results:

1. Energy consumption by power planers in agricultural mechanics laboratories is greatly affected by maintenance and operation variables. The magnitude of the energy saved when machines are kept properly adjusted and with sharp blades should be of great interest to agricultural mechanics teachers and school administrators who want to minimize energy waste and maximize energy economic efficiency in their agricultural mechanics programs.

2. Maintenance variables will have a greater influence on the amount of energy used and/or conserved than will operation variables. However, both types of variables contribute to energy conservation in the agricultural mechanics laboratory.

Recommendations

It is recommended that:

1. Agricultural mechanics teacher educators use these findings in pre-service and in-service instruction to help students and practicing teachers learn better techniques for conserving electrical energy in the school laboratory setting.

2. The results of this study be disseminated to planer users and school administrators to assist in maximizing energy conservation and reducing energy costs through proper maintenance and operation of power planers.

3. This study be replicated in other settings and on other equipment to ascertain the effects of maintenance and operation variables on energy conservation in the agricultural mechanics laboratory.

Table 6

Calculated Electrical Energy Savings Projected Over 100 Hours of Planer Operation by Maintenance and Operation Variables

Variable	Kilowatt Hours Used per 100 Hours of Operation		Electrical Power Savings in Kilowatt Hours
Maintenance			
Dull Blades & Unadjusted	525.5	}	242.9
Sharp Blades & Adjusted	282.9		
Operation			
Depth of Cut:			
1/8 inch	447.5	}	86.3
1/16 inch	361.2		
Wood Hardness:			
Hard (Oak)	460.6	}	43.8
Medium Hard (Walnut)	416.8	}	81.8
Soft (pine)	335.7	}	124.9
Hard (Oak)	460.6		
Rate of Feed:			
Fast	430.5	}	18.9
Medium	411.6	}	40.6
Slow	371.0	}	59.5
Fast	430.5		

References

Boggs, D. (1985). When will the lights go out? In E. Patterson (Ed.). Energy and environment, the unfinished business: The nations electricity supply...surplus or shortage in 1090's (pp. 12-13). Washington DC: Congressional Quarterly.

Burke, S. R. (1991). Maintenance effects on planer noise. Professional Development Seminar, Kansas City.

Carter, J. (1975-77). Fireside chat. In E. Patterson (Ed.) Energy and environment: the unfinished business: The nations electricity supply...surplus or shortage in 1990's (pp. 12-13). Washington DC: Congressional Quarterly.

Macrakis, M. S. (Ed.). (1974). Energy: Demand, conservation, and institutional problems. Massachusetts Institute of Technology.

Miller, G. T., Jr. (1975). Energy and environment: The four energy crises. Belmont, CA: Wadsworth Publishing.

Neill, S. B. (1977). School energy crises: Problems and solutions. Sacramento, CA: Educational News Service.

O'Neal, J. (1986). Workshop noise: Are machines damaging your hearing? Fines Woodworking (pp. 23- 6).

Plakke, B. (1985). Hearing conservation is secondary industrial arts classes: A challenge for school audiologist. Language, Speech, and Hearing in Schools, 16(1), 75-78.

Wall, R. A. & Jessee, C. R. (1971). Evaluation of occupational health hazards in agricultural education laboratories in Virginia. Unpublished research report, Blacksburg: Virginia Polytechnic Institute and State University.

CHARACTERISTICS OF THE DAIRY INDUSTRY IN THE 21st CENTURY WITH IMPLICATIONS FOR CURRICULUM DEVELOPMENT IN AGRICULTURAL EDUCATION

Gearl M. Collins, Jr., Ed.S.
Agriculture Instructor
Greene-Taliaferro Comp. High School
Greensboro, Georgia

Maynard J. Iverson
Associate Professor
Agricultural Education
The University of Georgia

Introduction

No one knows exactly what the work environment of the next century will be like, but it undoubtedly will be characterized by rapid, continuous change. Educational programs, such as agricultural education, must train today's student with skills that will be needed in tomorrow's workplace. The curriculum must be futuristic in nature to give students the opportunity to develop these skills. In today's rapidly changing world, information is often outdated by the time it is published. The task of the curriculum planner has become increasingly difficult. Educators must use futuristic research as a means for keeping the curricula current. A futuristic strategy utilizing the Delphi technique may be used to accomplish this goal (Finch & Crunkilton, 1989). The Delphi technique has been used in government, industry, medicine, regional planning, program planning, policy formation, and problem identification and solutions (Flanders, 1988).

It was determined from the literature that only limited information was available about dairy science education in the future. Futuristic predictions that were found appeared primarily in the popular press and had not been tested for validity. It was determined there was insufficient data available to base selection of curriculum content in the area of dairy production. Thus there was a need for this study to be conducted.

Purpose and Objectives

The purpose of this research was to determine the characteristics of the dairy industry in the 21st century in order to recommend content for agricultural programs of the future. Specific objectives were to determine:

1. the general characteristics of the dairy industry in the year 2000.

2. a demographic profile of opinion leaders in the dairy industry.

3. if the Delphi technique could be used to achieve consensus among dairy experts concerning the future of the industry.

4. the employment opportunities in the dairy industry and the educational requirements of those employed in the 21st century.

5. the agricultural education curriculum content needs for dairy science course work in the 21st century.

Procedures

This was a national futures study utilizing a modified Delphi technique. Collection of data consisted of four phases: instrument development, selection of a panel of experts, an initial round, and a final round of the Delphi. The Delphi survey instrument, consisting of 75 items on a five point Likert-type scale, was developed from dairy industry literature dealing with future directions of the industry. A draft of the instrument was reviewed for content and face validity by 12 persons who had expertise in the dairy science field, in futures research, and/or in education.

The top 25 futurists in the dairy industry were selected to participate through a national nomination process. Nominators were chief officers of dairy industry associations, authors, editors and managers of dairy publications and texts, and dairy science and Extension dairy science department heads in the top 25 milk-producing states of 1990. Two hundred and thirty nominations were received. Twenty of the 25 most frequently nominated experts agreed to serve on the panel. The five non-participating experts responded with explanations for their inability to participate. The 20 panelists were geographically dispersed across the United States, but tended to be concentrated in the Midwestern and Northeastern states.

Analysis of Data

Statistics used to analyze the data included frequencies, composite score, means, percentages, medians, standard deviations, interquartile ranges, Pearson product-moment correlation coefficients, and the Wilcoxon matched-pairs signed-ranks test. Stability of responses between rounds, group agreement, and item ranking were determined using these statistics.

Results

The 20 members of the expert panel were all males, ranging in age from 35 to 71 years with a mean of 51.4 years. Nine of the experts held the title of Professor or Department Head at universities, eight were Extension Specialists, four were officers in breed, trade, or research associations, two were editors of dairy industry publications, and two were dairymen. Thirteen of those selected to the panel of experts had Ph.D. degrees. The 20 member panel had a total of 563 years of experience in the industry and/or academia. The range of experience was from 12 to 39 years. The mean number of years of experience was 28.2 with a standard deviation of 8.72. A description of the experts is not necessary for the interpretation of the results of the Delphi, but this information can be important in selection of groups for further study.

The standard deviations and interquartile ranges indicated a tendency toward consensus. In 73 items (93.3%), the standard deviations decreased around the mean and the interquartile ranges decreased for 59 items (78.7%), becoming closer to the median. The responses were found to be stable (not significantly changed from round one to round two) in 72 items (96%) using Pearson product-moment correlations and in 70 items (93.3%) using the Wilcoxon matched-pairs signed-ranks test. These tests indicated that further rounds of the Delphi technique would have been of little benefit (Cohen, 1988).

A composite score, as used by Dillon and Wright (1980), was calculated on round two data for each item and used to rank the items in order of agreement. The highest ranked items dealt with increased emphasis on forage and fiber analysis in formulating dairy rations, increasing the average cow herd size in the United States, and the utilization of more experts, such as veterinarians, financial counselors, and nutritionists, in dairy management. The items ranked lowest (indicating disagreement) were concerned with BST approval and use being essential to the survival of the dairy industry, availability of drug treatments for use by dairymen, and video cameras being placed in dairies by health inspectors to randomly make quality checks. Those findings are presented in Table 1. Respondents made a total of 555 explanatory comments--297 in round one and 258 in round two.

Consensus, as defined by Hill and Fowles (1975), was indicated on an item if (a) at least 60% of the respondents were in agreement, and (b) the composite score was less than 50 or greater than 70; that is, the composite scores were either in the agreement or disagreement range. Seventeen items (22.7%) did not meet the criteria for consensus. Of the 58 items on which consensus was reached, eight items (10.7%) were in the "disagree" range and 50 items (66.7%) were in the "agree" range.

Table 1
Items of Highest and Lowest Rank by Composite Score

Item #	Item Rank	Composite Score	
Highest Ranked Items			
1.	1	97	Dairymen will place additional emphasis on forage and fiber analysis to formulate rations.
38.	2	97	The average U.S. dairy cow herd size will rise to 60 or more.
51.	3	96	More experts, such as veterinarians, financial counselors, and nutritionists, will be utilized in dairy management.
37.	4	95	The number of U.S. dairy farmers will decrease to less than 138,000.
64.	5	95	Lowfat and "light" dairy products will capture a larger share of the market.
17.	6	94	A nationwide residue penalty program will be implemented.
29.	7	94	Dairy products will continue to be an important part of America's diet.
34.	8	94	Pricing plans that place value on protein or the solids-not-fat components of milk will be placed in the federal pricing system.
62.	9	94	Most of the new technologies will be more management intensive, requiring greater sophistication in managing the dairy enterprise.
53.	10	88	Dairy farms will become larger in order to be more competitive.
Lowest Ranked Items			
21.	66	51	A supply management system, created by dairymen, will be implemented.
58.	67	49	The top three milk-producing states will be California, Wisconsin, and Texas.
19.	68	47	Dairymen guilty of selling milk containing drug residues will have their names published.
54.	69	47	At least 15% of all dairy farms will have a milk robot.
4.	70	46	Dairymen will use more storage units of smaller size to allow optimal storage and allocation of various qualities of forage that are harvested.
8.	71	44	Technology will revolutionize the cheese industry by moving a portion of the cheese making procedure to the farm.
71.	72	43	State governments will be completely out of the dairy industry.
42.	73	41	BST will be essential to the survival of the dairy industry.
18.	74	39	There will be no approved drug treatments available for use on dairy cattle.
57.	75	39	Video cameras will be placed in dairies by health inspectors so they can randomly make quality checks.

Eighteen content areas are recommended for inclusion in agricultural education in order to prepare workers for the dairy industry of the 21st century (see Table 2). Dairy science course work in agricultural education should be emphasized and expanded. Preservice programs should include dairy science courses. Inservice workshops for teachers should utilize dairy industry personnel.

Table 2
Curriculum Content Items

Agricultural ethics
Animal breeding and genetic improvement
Biotechnology in dairy science
Career opportunities
Computers in dairy science
Cooperative business organizations
Dairy cattle judging and evaluation
Dairy mechanics and technology
Dairy processing
Farm and agribusiness management
Forage production and management
Herd health
Leadership and personal development
Marketing products and by-products of the dairy industry
Milk secretion
Quality control techniques
Reproductive management
Ruminant nutrition and feeding

Major changes in the curriculum for dairy science instruction are needed. The dairy industry will need well-trained workers in the future. Agricultural educators can have a decisive role in the future of the industry if futuristic curriculum, faculty, and facilities are utilized.

Conclusions and Recommendations

It was concluded that:

1. The dairy industry will grow and change rapidly into the 21st century, especially in the areas of production and marketing. Emerging new technologies will require that vocational education in dairy science be continually kept up to date.

2. Opinion leaders in the dairy industry were educators and researchers with 85% being professionally affiliated with a university. The experts were well educated with 13 of them having a Ph.D. degree. Opinion leaders in the dairy industry can best determine content for dairy science programs of the future.

3. The Delphi technique was effective in determining consensus among dairy industry experts regarding future characteristics of the industry, and program focus for the 21st century could be recommended based on the consensus of experts. Two rounds are adequate in a Delphi study when a structured instrument is utilized.

4. There will continue to be employment opportunities and an increasing need for trained workers and consequently appropriate training programs in dairy science.

5. There is a need to continually update the dairy science curriculum in agricultural education programs. Dairy industry leaders should be used as resource people in the development and updating of curricula.

References

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Hillsdale, NJ: Lawrence, Erlbaum Associates.

Dillon, B. & Wright, R. (1980). Educational predictions: Past, present, and future. In L. Jennings & S. Cornish (Eds.), Education and the future (pp. 102-110). Washington, DC: World Future Study.

Finch, C. R., & Crunkilton, J. R. (1984). Curriculum development in vocational and technical education: Planning, content, and implementation (3rd ed.). Boston: Allyn and Bacon.

Flanders, F. (1988). Determining curriculum content for nursery/landscape coursework in vocational agriculture for the 21st century: A futures study utilizing the Delphi technique. Unpublished doctoral dissertation, Athens: University of Georgia.

Hill, K. Q. & Fowles, J. (1975). The methodological worth of the Delphi forecasting technique. Technological Forecasting and Social Changes, 7, 179-192.

A Complete Listing of the Paper Proposals Submitted for Consideration at the 1993 National Agricultural Education Research Meeting
Nashville, Tennessee

Planning an educational program in the diffusion and adoption of a new technology
Robert N. King, Timothy J. Rollins (The Pennsylvania State University)

Investigating attitude toward and ability to use microcomputers: A comparison of secondary agriculture and other vocational teachers
N. L. McCaslin, Robert M. Torres (The Ohio State University)

Prolific authors in the journal of agricultural education during the eighties: An empirical study
Rama B. Radhakrishna (The Pennsylvania State University); Gary B. Jackson (Mississippi State University)

Perceptions of Georgia high school agricultural education instructors regarding the hunter education program
James E. Corbett (Lowndes Middle School, Valdosta, GA), Ray V. Herren (The University of Georgia)

A profile of black agricultural students at selected 1862 and 1890 land grant institutions
Marquita C. Jones (Michigan State University), Connie D. Baggett (The Pennsylvania State University)

The academic engagement practices of secondary agriculture teachers in West Virginia: An observational study
Mary J. Kerns, Kerry S. Odell, Layle D. Lawrence, Stacy A. Gartin (West Virginia University)

Job satisfaction of extension faculty employed by the West Virginia university extension service
Stacy A. Gartin, Erica L. Johnson, Kerry S. Odell, Charles Morris (West Virginia University)

Evaluation of the goals and objectives of the Nebraska leadership education program
Larry L. Andelt, Roy D. Dillon (University of Nebraska-Lincoln)

The efficacy of the adoption diffusion theory for agricultural education
Timothy J. Rollins (The Pennsylvania State University)

Relationships between occupations of home-based workers and selected demographic and work characteristics
Marilyn M. Furry, Rama B. Radhakrishna (The Pennsylvania State University)

An evaluation of the leadership involvement of alumni from the Nebraska leadership education/action development program-A ten year followup study
Roy Dillon, Larry L. Andelt (University of Nebraska-Lincoln)

Hispanics in agriculture: Barriers to educational recruitment
Timothy Nichols (Moscow, ID), Clifford Nelson (Washington State University)

An empirical examination of the journal of agricultural education
Gary B. Jackson (Mississippi State University), Rama B. Radhakrishna (The Pennsylvania State University)

Members' knowledge and perceptions of agriculture
Martin J. Frick (Purdue University), Robert Birkenholz (University of Missouri)

A conceptual model for effectively planning and delivering distance education courses and programs in agriculture
Gary B. Jackson, Blannie E. Bowen (The Pennsylvania State University)

The effects of nonaccessibility and nonresponse on survey research outcomes--A case study
Lou E. Riesenberg, Kumarasiri Samaranayake, Dale O. Everson (University of Idaho)

Secondary agriculture summer programs as viewed by Idaho secondary agriculture instructors
Joseph A. Blackstock (Kuna, ID High School), Lou E. Riesenberg (University of Idaho)

Self-perceived leadership behaviors and practices of county extension directors: A national perspective
Rama B. Radhakrishna, Edgar P. Yoder, Connie D. Baggett (The Pennsylvania State University)

Education and beyond experiences of postsecondary vocational-technical education program participants based upon selected characteristics
M. Susie Whittington, Lou E. Riesenberg (University of Idaho)

Summer program activities in agricultural science
Michael K. Swan (North Dakota State University)

Interactive video network educational instructional methods
Michael K. Swan (North Dakota State University)

A study of the adoption and non-adoption of approved practices by Minnesota dairy farm operators
Earl W. Bracewell, Edgar A. Persons, Abderrazak Lakjaa, Chunju Chen (University of Minnesota)

Comparing levels of competence of occupational educators in their ability to carry out professional teaching competencies
Vernon D. Luft (University of Nevada, Reno)

Training needs of area specialized extension agents in the North Carolina cooperative extension service
Jerry D. Gibson (North Carolina Cooperative Extension Service, John Hillison (Virginia Polytechnic Institute and State University)

Leadership abilities of secondary public school teachers
Michael L. Kamrath, Michael K. Swan (North Dakota State University)

Mathematical problem-solving ability of secondary agriculture teachers
Greg Miller (Iowa State University), Joe A. Gliem (The Ohio State University)

Integrating mathematics concepts into secondary agriculture programs
Greg Miller (Iowa State University), Joe A. Gliem (The Ohio State University)

Distance education in agriculture: Teaching and learning through videotape
Greg Miller, Mark Honeyman (Iowa State University)

Agricultural distance education: A valid alternative for higher education?
Greg Miller, Mark Honeyman (Iowa State University)

Perceptions of field officers, extension officers and farmers regarding agricultural extension education in Swaziland
Musa M. A. Dube, Robert A. Martin (Iowa State University)

Safety Practices in agricultural science laboratories
Michael K. Swan (north Dakota State University)

Perceptions of agricultural extension agents regarding agricultural biotechnology training and information needs
Robert A. Martin (Iowa State University), E. Craig Williams (Indiana Extension Service)

Personality styles of preservice teachers of agriculture
Jamie Cano, Bryan L. Garton (The Ohio State University)

An assessment of the educational delivery systems employed by commercial field agronomists in publicly and privately owned cooperatives
Robert A. Martin, Delbert G. Voight, Jr. (Iowa State University)

Learning styles and their relationship with performance in a methods of teaching agriculture course
Jamie Cano, Bryan L. Garton (The Ohio State University)

An evaluation of the secondary agricultural education summer program as viewed by Idaho public school administrators
John P. Mundt (University of Idaho), Jack W. Blattner (Meridian, ID High School)

Factors influencing minority and non-minority students to enroll in an introductory agriscience course in Texas
B. Allen Talbert, Alvin Larke, Jr. (Texas A&M University)

Knowledge level and attitude towards agriculture and natural resources held by eighth grade students
Jamie Cano (The Ohio State University)

Predictors of academic performance for collegiate agricultural majors
Steven D. Fraze, Toby Miller, David E. Lawver (Texas Tech University)

Media influence on minority enrollment in secondary agricultural science courses in Texas
Wendy Dougherty, Steven D. Fraze, Paul R. Vaughn (Texas Tech University)

Knowledge about and perceptions towards diversity by extension administrators
Barbara Ludwig (Ohio Cooperative Extension Service), Jamie Cano (The Ohio State University)

Effect of student factors on a teacher evaluation instrument
Paul R. Vaughn, Robert Terry, Jr., Marvin Cepica (Texas Tech University)

Opinions of graduates concerning the curricular and extra-curricular activities of the college of agricultural sciences
Cynthia Wrye, Robert Terry, Jr. (Texas Tech University)

Perceptions of university students about issues related to agriculture
Robert Terry, Jr., David E. Lawver (Texas Tech University)

An editorship, authorship, theme, and topic analysis of The Agricultural Education Magazine
Jamie Cano, Robert M. Torres (The Ohio State University)

Laboratory safety compliance in selected secondary agricultural science and technology programs
Shahran Kasim, David E. Lawver, Steve Fraze (Texas Tech University)

Agricultural mechanics laboratory noise levels in selected secondary agricultural science and technology programs
Brent Besler, David E. Lawver, Steve Fraze (Texas Tech University)

Who's in charge here? An analysis of the leadership in agricultural education provided by the federal board for vocational education
Gary Moore (North Carolina State University), John Hillison (Virginia Tech)

Factors associated with work attitudes of secondary agricultural education students in selected counties of Virginia
Austin J. Bull, Martin B. McMillion, (Virginia Tech)

Attitudes and perceptions of superintendents, principals, guidance counselors, and agriculture teachers toward agricultural education reform in Kentucky
Tony L. Brannon (Murray State University), David Coffey (Western Kentucky University)

The relationship between levels of cognition of instruction and learning style of horticulture teachers
Jamie Cano, Susan Metzger (The Ohio State University)

Secondary science and agriculture pesticide education curriculum development
Kerry M. Hoffman (The Pennsylvania State University)

An analysis of information sources used in dairy reproductive management
Fawzia Sulaiman (Indonesia Ministry of Agriculture), Connie D. Baggett, Edgar P. Yoder (The Pennsylvania State University)

An historical perspective on Mexican migration to the United States: Program planning implications for agricultural educators
Carol A. Conroy (The Pennsylvania State University)

Activities which promote participation in FFA contests and awards by students of different race, gender, and demographic backgrounds
Mark Blakely, Marilyn Holschuh (Synergy Research), Bob Seefeldt (National FFA), Glen Shinn (Texas A&M University), Edward Smith (Oklahoma State Department), Paul Vaughn (Texas Tech University)

Perceived value of FFA contests and awards by students and other adult groups
Mark Blakely, Marilyn Holschuh (Synergy Research), Bob Seefeldt (National FFA), Glen Shinn (Texas A&M University), Edward Smith (Oklahoma State Department), Paul Vaughn (Texas Tech University)

Factors related to the decision to adopt or not adopt new technology
Jonathan C. Atherton, Joe G. Harper, Glen C. Shinn (Texas A&M University)

The effect of teaching strategy on student achievement and satisfaction in a videotaped agriculture safety course
Greg Miller, Carol J. Lehtola, Mark Honeyman (Iowa State University)

The perceptions of young farmers regarding the role of international agriculture in agricultural education
Kamal Ali Elbasher, Robert A. Martin (Iowa State University)

Perceptions of farmers regarding indigenous knowledge systems
B. Rajasekaran, Robert Martin (Iowa State University)

Preservice elementary education majors' knowledge of and perceptions toward agriculture
John Kevin Humphrey, Bob R. Stewart, Richard E. Lindhardt (University of Missouri-Columbia)

Educational delivery methods preferred by landowners for information on the wetlands reserve program
Julia Gamon (Iowa State University), Cletus Swackhamer, Iowa Extension Service)

Delivery strategies for faculty professional development in Iranian colleges of agriculture: A comparison by administrative responsibility, teaching experience and education level
Mahmood Hosseini (Zanjan University, Iran), H. Dean Sutphin (Cornell University)

Reasons tenth grade students study agriculture in high school by gender and ethnicity
H. Dean Sutphin, Mhora Newsom-Stewart (Cornell University)

Factors that are leading to and inhibiting high quality agricultural programs in Belize: Implications for program improvement
Roy Young (Cornell University)

Development of an action research process to evaluate and implement a new vision in the Cornell cooperative extension 4-H youth development program
Mhora Newsom-Stewart (Cornell University)

Agriculture, environmental science and the relationship of agriculture to academic courses as perceived by tenth grade students: Comparison by gender and ethnicity
Mhora Newsom-Stewart, H. Dean Sutphin (Cornell University)

A longitudinal study of compare students enrolled in the college of agriculture's general agriculture curriculum project with a similar group enrolled in the college of agriculture
Gary S. Straquadine, Ann Marchant-Moedl, Weldon Sleight (Utah State University)

The application of exploratory factor analysis in agricultural education research
Matt Raven, Montana State University)

The relationship between students' ability to demonstrate the problem solving approach to teaching in a methods class and their learning styles
Matt R. Raven, Van Shelhamer (Montana State University)

Factors related to recruitment and retention of ethnic minority youth in the Ohio 4-H program
Joanne Bankston (Kentucky State University), Jamie Cano (The Ohio State University)

Instrumentation to measure youth leadership life skills development
Brenda Seevers, Thomas J. Dormody (New Mexico State University)

Realistic expectations of beginning secondary agriculture education teachers as perceived by beginning secondary agriculture teachers and their principals in the western United States
John Mundt, Laurie A. Stenberg (University of Idaho), Troy S. Wright (New Plymouth, ID High School)

Curriculum and curriculum reform in agricultural education in Virginia
Rick Rudd, William G. Camp (Virginia Polytechnic Institute and State University)

A national study of early field experience requirements for pre-service agricultural education majors
Jacquelyn P. Deeds (Mississippi State University)

A national study of student teaching requirements in agricultural education
Jacquelyn P. Deeds (Mississippi State University)

A national study of field experience requirements for non-teaching agricultural education majors
Jacquelyn P. Deeds (Mississippi State University)

Who's in charge here? An analysis of the leadership in secondary agricultural education provided by the United States department of agriculture
Gary E. Moore (North Carolina State University), John Hillison (Virginia Tech)

Who's in charge here? An analysis of the leadership in secondary agricultural education provided by the United States department of education
Gary E. Moore (North Carolina State University), John Hillison (Virginia Tech)

Who's in charge here? An analysis of the leadership in secondary agricultural education provided by the National Council for Agricultural Education
Gary E. Moore (North Carolina State University), John Hillison (Virginia Tech)

Extension as an information source for farmers
Larry J. Klingbeil (East Texas State University), Edgar Persons, Chunju Chen (University of Minnesota)

A determination of management skills required by Indiana dairy producers
Don McCay, Jerry Peters (Purdue University)

A comparison of information sources used by farmers who enrolled and those who did not enroll in selected farm business management programs in Minnesota
Larry J. Klingbeil (East Texas State University), Edgar Persons, Chunju Chen (University of Minnesota)

Inservce education needs of teachers of pilot agriscience courses in Mississippi
Michael E. Newman, Donald M. Johnson (Mississippi State University)

The influence of agrarian career contingencies and the impact of socioeconomic status upon agricultural education students' occupational aspirations
Donald L. McLellan, J. David McCracken (The Ohio State University)

Analysis of agriculture education textbooks for use with special needs learners
Karen H. Jones (University of Georgia)

Variables associated with attitudes of teachers toward computers in Korean secondary vocational agriculture programs
Seung Il Na, R. Kirby Barrick (The Ohio State University)

Predictors of teachers' computer use in Korean vocational agriculture high schools: A proposed framework
Seung Il Na, R. Kirby Barrick (The Ohio State University), Mu-Keun Lee (Seoul National University)

Longitudinal study of undergraduate agriculture majors: 1977, 1982, 1987 and 1992
Walter N. Taylor, Donald M. Johnson (Mississippi State University)

Relationship between selected student characteristics and community college agriculture program choice
Donald M. Johnson, Walter N. Taylor (Mississippi State University), Thad O. Owens, Jr. (Hinds Community College)

The application of servqual in measuring the quality of service provided by Minnesota extension service (MES)
Chunju Chen, Gary Leske, Richard Krueger (University of Minnesota)

Perceptions of the priorities of Minnesota extension service's mission
Chunju Chen, Edgar Persons, Richard Krueger (University of Minnesota)

A comparison of the perceptions of institutional stakeholders of the factors that contribute to institutional excellence
Richard Joerger (University of Wisconsin-Madison), George Wardlow (University of Arkansas)

Cognitive learning style preferences of the Minnesota farm business management educators
Richard Joerger (University of Wisconsin-Madison), Edgar Persons (University of Minnesota)

The relationship between perceptions about agriculture and the use of agriculture as a theme for elementary school science instruction
Cary Trexler (Sanilac County, MI Intermediate School District), Murari Suvedi (Michigan State University)

Job satisfaction of vocational teachers
David Padilla-Velez (University of Puerto Rico, Mayaguez)

Characteristics of the dairy industry in the 21st century with implications for curriculum development in agricultural education
Gearl M. Collins, Jr. (Green-Taliaferro Comprehensive HS), Maynard J. Iverson (The University of Georgia)

A quantitative guide to assess institutional excellence in vocational education
George Wardlow (University of Arkansas), Richard Joerger (University of Wisconsin, Madison)

Relationship between supervisory techniques of extension supervisors and organizational outcomes in Uganda
Wesley E. Budke, Paul Padde (The Ohio State University)

Information seeking practices of Ohio agriculture teachers
Wesley E. Budke (The Ohio State University)

The extent student teachers utilized the problem-solving approach to teaching during the student teaching practicum
Bryan Garton, Jamie Cano (The Ohio State University)

The influence of agriscience and natural resources curriculum on students' science achievement scores
James J. Connors, Jack Elliot (The University of Arizona)

Readership survey of the FFA New Horizons magazine
James J. Connors, Jack Elliot (The University of Arizona), Dave Krueger (Michigan State University)

Agricultural awareness in Arizona
Robert Flood (Pima Community College), Jack Elliot (The University of Arizona)

Cognitive abilities of college of agriculture students across traditional content areas
Robert M. Torres, Jamie Cano (The Ohio State University)

Effects of equipment maintenance and operation variables on energy use in the agricultural mechanics laboratory
Stanley R. Burke (Virginia Tech)

The importance of selected mathematics concepts/skills and applications as perceived by Mississippi high school agriscience and mathematics teachers for the introduction to agriscience curriculum
James N. Butler, Jr., Jasper S. Lee (Mississippi State University)

A study to determine farming practices used and the perceived barriers to adoption of additional sustainable practices in Utah
Gilbert A. Long, Bruce E. Miller, David F. Wilson (Utah State University)

Agricultural literacy among secondary educators in Missouri
Clark Richard Harris (State Fair Community College), Robert J. Birkenholz (University of Missouri)

Perceptions of critical competencies for the survival of beginning agriculture and home economics teachers from four educational perspectives
Laurie Stenberg Nichols (University of Idaho), John Mundt (University of Idaho, Boise Center)

Trends in the placement and employment characteristics of agricultural mechanization graduates from Iowa state university
Richard Steffen (Illinois State University), W. Wade Miller, Victor Bekkum (Iowa State University)

Factors influencing resource sharing between agriculture and science teachers participating in the agriscience program
Linda Whent (University of California, Davis)

Pilot evaluation of the biotechnology in agriculture curriculum in Oklahoma: A progress report
Jeffrey W. Horne, James P. Key (Oklahoma State University)

The effectiveness of computer-assisted instruction in a course on landscape plant use
Mona Rae Corbett, Christine D. Townsend, Jayne M. Zajicek (Texas A&M University)

Identifying correlates to career integration: Examining a model
Thomas L. Grady (Southwest Texas State University)

Organizational value of Minnesota extension service
Walter A. Barker, Gary Leske, Richard Krueger (University of Minnesota)

The role of agricultural societies in the development of agricultural education 1785-1860
John D. Parmley (Kansas State University)

The effect of hearing protection devices under pink noise conditions on motor and cognitive performance
Glen M. Miller, Steve Schimpp (The University of Arizona)

Differences in attitudes of agricultural education and other vocational education cooperating teachers regarding student teaching expectations
Jim Flowers (North Carolina State University)

471